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Organic Gardening

MAY 1949
15 Cents

GARDENING AND FARMING WITHOUT COMMERCIAL FERTILIZERS

AGRICULTURAL
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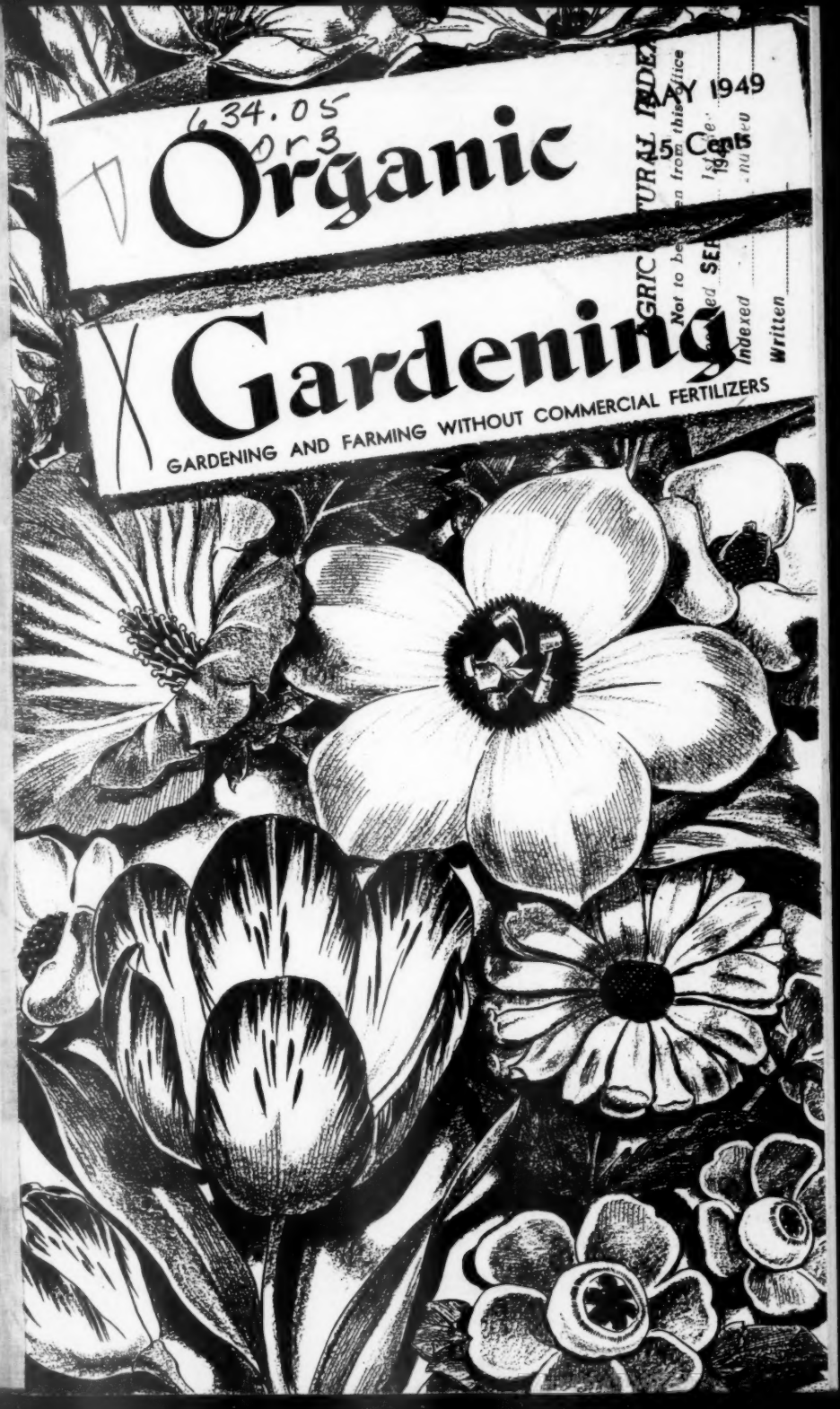

K-K SMALL EARTHWORMS SUPER-COMPOST

K-K SUPER-COMPOST

The compost that does so many things: It renews the soil, feeds the earthworms and plants; it feeds the bacteria, fungi, protozoa and all the other living things of the soil. It brings the soil to life—gives it vigor and starts the acids and gases to working. It adds to the soil the richness and variety of the Super-Compost, releases minerals and other elements from the soil, and causes the soil to take in richness from the air. It softens hard soils and gives body to sandy soils, and makes all soils hold moisture better.—And Super-Compost is so completely natural.

K-K SMALL EARTHWORMS

They are such active little 'shavers'—and so intelligent. They know just where to get to do the most good.—They cuddle up around the roots of your plants, to enrich the soil there and make it so very, very easy for the tiny hair roots to take up and the plants to digest.

These busy little fellows like to work among your flowers and shrubs, and in your fruit and vegetable garden too, and they are right at home in your lawn.—And that is where they are really needed most, for everybody likes a lovely lawn.

Super-Compost and small earthworms, that's the combination for garden, shrubs, and lawn.

•

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GARDEN SUPPLY and NURSERY and FARM

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(Near Oakland, Calif.)

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Convert your Hand Mower to a *POWER* Mower for only $4.50*

... that's only ONE of the sensational advantages in owning

"Handy-Worker, Jr.

IMAGINE! A simple bracket converts your present hand mower to a *power* mower for only $4.50* if you own an amazing Handy-Worker, Jr. Garden Tractor. Weighs only 80 lbs., complete with 1½ h.p. air-cooled engine, pneumatic 14" tire, throttle, adjustable handles, built-in power take-off and patented internal overriding "*safety*" clutch.

This sensational new work-saver is designed and manufactured by the makers of the famous Handy-Worker Rotary Tiller which has been acclaimed enthusiastically everywhere, especially by organic gardeners. Strong, rugged, and the price is only . . . **$129.50***

Look at these labor-saving attachments, and at these unbelievably low prices.

* Lawn Mower Converter Bracket $4.50*
* Earth and Snow Dozer $12.50*
* Cultivator Assembly $13.50*
* 28" Sickle Bar Mower $45.00*
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ALL ATTACHED IN *ONE MINUTE* OR LESS!

And—attachments at prices Everyone Can Afford!

* Cultivator Assembly $13.50*

* Sickle Bar Mower $45.00*

Write for free literature
ROLLE MFG. CO., INC.
Lansdale, Penna.

*F.O.B. Factory

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VOLUME 14, NUMBER 5 MAY 1949

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ORGANI-CULTURE

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LIFE SUBSCRIPTIONS

ORGANIC GARDENING MAGAZINE has decided to have a standing offer of life subscriptions at a price of $35.00. Regardless of your age, you will receive the magazine for the rest of your life. You will thus be relieved of the detail work of renewing from year to year.

For those who desire to make payment over a period of one year, send $5.00 and we will bill you for $5.00 every two months, until a total of $35.00 is paid.

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Users Insist There's Garden Magic in this can!

TRY THIS ORGANIC DISCOVERY OF SCIENCE AND SEE IF YOU DON'T AGREE

Makes compost quicker, easier, cheaper and better out of difficult materials.

•

Use even sawdust and chaff. Compost garbage and sludge without odor! These make the richest humus known to man!

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See the magical difference it will make in weak, sluggish soils—just a few handfulls mixed into soil. It conditions, activates—adds life, energy and vitality.

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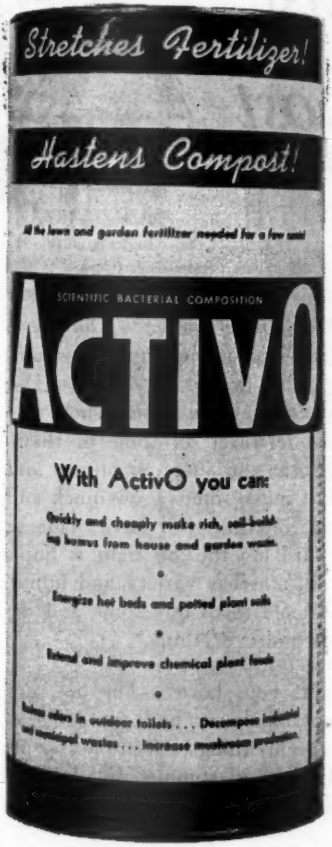
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Hastens Compost!
All the lawn and garden fertilizer needed for a few cents
SCIENTIFIC BACTERIAL COMPOSITION
ACTIVO
With ActivO you can:
Quickly and cheaply make rich, soil-building humus from house and garden waste.
Energize hot beds and potted plant soils
Extend and improve chemical plant foods
Reduce odors in outdoor toilets . . . Decompose industrial and municipal wastes . . . Increase mushroom production.

Plant a little with each seed and see the difference in your plants—and the yield! Flowers, too, have better color.

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Use ActivO to make your own organic fertilizer and liquid manure — quickly (complete directions tell you how to do this and dozens of other unusual garden tricks.) Use it in hot beds, or to make hot beds without manure.

•

ActivO is a rich, black, velvety humus fortified with billions of Nature's own beneficial micro-organisms, hormones, vitamins, minerals and the mysterious biotics, Nature's balancers.

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It's cost is amazingly little. (See below.) And it's *good for* your compost, *good for* your soil, *good for* EARTHWORMS.

•

Please do not accept substitutes. There's NOTHING like it; nothing "just as good".

MAIL TO ➔ BENSON-MACLEAN PLANT PRODUCTS, Bridgeton 4, Ind.

Inclosed is ..... for $..... Send the following: (Add 10% West of Rockies)

☐ No. 7 size, 1700 lb. compost, at $2.00 ea. postpaid.

☐ No. 25 size, up to 3½ tons compost, $6.99 (prepaid 400 miles), with FREE Composter Cabinet plans.

☐ No. 50 size, for 6½ tons, $11.95, freight collect.

☐ FREE literature; ActivO and composting.

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ADDRESS .....

P. O. and State .....

Dealer's Name .....

And Address .....

SHIPPING POINT If different from P. O.

ActivO makes compost in sanitary CABINET—in basement, garage or tiny backyard. Free plans with No. 25 size. Check above.

MORE THAN A COMPOST HASTENER!

ActivO

Johnny Compost says--

"What about that natural garden?—Don't you know that to have a natural garden that will grow healthy things, and make you healthy, you have to do something to make it that way?—And it won't do no good to just put some manure on it—it's short in variety—, or to employ 'rotgut chemical fertilizer' or some of them 'hot-shot chemical getups' they're unnatural and short on humus and variety. They are just coverup guys that make things grow quick and big and look swell, but you find out later on that they have made a mess out of everything.—The thing that'll do the job right is Super-Compost, because it is natural and mild, and has variety and humus and everything it takes.—And it's not too late to buy some and dig it in around your vegetables, and fruits and everything.

"And, what about your lawn?—The hot, dry summer days are almost here.—You better hurry and get some *K-K Super-Compost* into it, so it will have something to feed on and protect it through the long hot, dry, windy days of summer and fall. Yes siree, your lawn needs the right kind of food then!

"And, while I'm about it, let me remind you about K-K SMALL EARTHWORMS. They're good for your lawn, garden and everyplace.

"Write for literature and prices right now, or you may forget, or place an order right away."

•

KNAPP & KNAPP GARDEN SUPPLY AND NURSERY

988 LEWELLING BLVD., SAN LORENZO, CALIFORNIA

LOckhaven 8-2287 LUcerne 2-0503

(Near Oakland, California)

COMPOST DOES IT!

Dear Mr. Rodale:

Dymond has confirmed the mycorrhizal hypothesis in the case of sugar cane. Streak disease (a virus trouble) can be cured by compost. The offspring (grown with compost) is not infected by a diseased row alongside. He has also evolved a very neat method of composting night soil with the wastes of a cane estate and has suggested how the surplus vegetable wastes of a cane estate can be used for manufacturing humus by a municipality.

A. H.

—o—

MUNICIPAL COMPOST

Dear Mr. Rodale:

Auckland, New Zealand, will, I think, be the first of our cities to deal with sewage and municipal composting as one great subject, using everything and returning the water in a pure condition. I am certain there is a great opening in the U. S. A. on these lines, particularly in the South where the water hyacinth—the ideal plant for the job—grows well.

A. H.

—o—

THANKS TO MR. NELSON

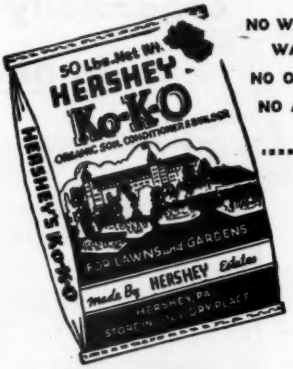
Dear Sir:

You will no doubt remember the article entitled "Confessions of a Mulcher" in the April 1947 number of Organic Gardening by Mr. Avery Nelson—by the way, I want to thank him for that article. Well, I was intrigued by it and suggested to my father that we try it. So late last fall, we sheet mulched a portion of our garden with alfalfa waste hay secured at a dairy; let it lay all winter, watered it when it did not rain. Then in the

Now Is The Time!

Condition your soil for this year's lawn and garden

Insure garden success! Start right! Condition the soil! Healthy, vigorous-growing plants begin with good, fertile soil.



NO WEEDS
WATER
NO ODOR
NO ACID

HERSHEY'S

Ko-K-O

ORGANIC SOIL BUILDER AND CONDITIONER

FOR LAWNS AND GARDENS

- Apply Direct to the Soil
- Mix in the Compost Heap
- FEED TO EARTHWORMS

An essential material for the Organic Gardener .... A slow-acting, long-lasting energizer that increases and replenishes the organic content of the soil .... Improves soil texture .... absorbs and retains plant-nourishing moisture .... helps decomposition of soil break-up into humus .... binds sandy soils .... loosens clay soils.

WHAT IS HERSHEY'S Ko-K-O?

Cocoa bean shells and other parts of the cocoa bean are expertly blended and sweetened to produce a natural, organic material furnishing a steady source of humus for the soil.

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NEW LOW PRICE

Send $1.90 for each 50 lb. bag; enough for 200 sq. ft. of NEW lawn or garden. Minimum Shipment 100 lbs. (2 bags).

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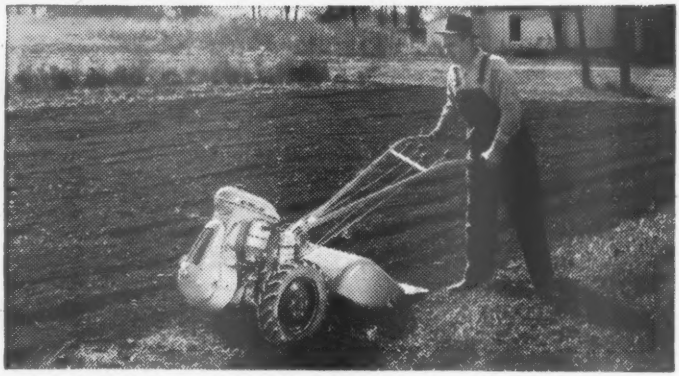
HERSHEY, PENNSYLVANIA

Prepare a perfect, organically-enriched seed bed *in one operation!*



WITH

ROTOTILLER*

POWER TILLER OF 100 USES

Get your carefully-hoarded compost into the soil the way nature intended . . . mixed all through, not just spaded in! Rototiller's high-speed, power-driven tines grind compost fine . . . turn it under . . . mix it evenly into the soil to a depth of nine inches . . . prepare a *perfect* organically-enriched seed bed . . . all in one operation! Soil is left in condition to attract earthworms.

Rototiller cultivates all summer, turns green manure and cover crops under in fall. You need this "power tiller of 100 uses" to get full rewards, without back-breaking toil, from *your* organic gardening. Write for full information.

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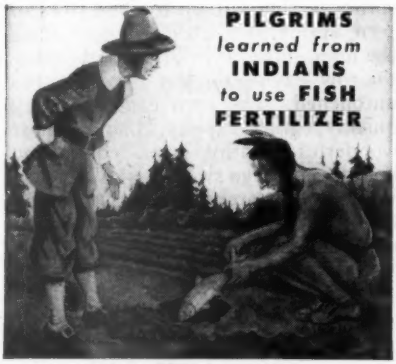
York, Pennsylvania
A Division of **GRAHAM-PAIGE MOTORS CORP.**
*Trade Mark Reg. U. S. Pat. Off.



PLANTS Need A
BALANCED DIET
just as YOU do

Plant health, like human health, depends strongly upon a balanced diet. From camellias to cabbages, all plants thrive, resist diseases and pests when ALL the plant food essentials are in the soil.

Modern science has proved that plants need not only nitrogen, phosphorus and potassium — but also 14 other elements in small but essential amounts, for perfect health and growth. And no one can KNOW that **ALL 17** vital essentials are in his soil—without a costly **complete** soil analysis.

ATLAS *FERTILIZER EMULSION*

ALL ORGANIC

is a POWERFUL CONCENTRATE made from sea-going fish. It is rich in natural "life factors" without which no plant or animal long survives—including the complete B-complex vitamin groups. It contains ALL 17 plant food essentials and valuable trace minerals—more than any soil, compost, manure or other fertilizer. Just dilute ATLAS with water as directed—apply with can or hose applicator. Use for all gardening, compost, potted plants, lawns, flowers, vegetables, berries, trees, shrubs.

DEALERS—Write for Proposition.

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Please send me your trial pint (makes 80 gals.) of ATLAS FERTILIZER EMULSION–$1.00 enclosed.

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City_____ State_____

My garden supply dealer is—

His name_____

His address_____

City_____ State_____

MAY-48

Everything that *grows* GROWS BETTER
— in PREMIER CONDITIONED soil

THE surest and easiest way to improve your garden is to improve your *soil* with Premier Peat Moss.

Premier literally gives your soil *New Life*. It opens up the soil to air and moisture by adding *pure, weed-free, spongy, 97% organic matter* that readily mixes in. It absorbs 20 times its weight in moisture . . . makes soil breathe deeply . . . prevents surface crusting . . . feeds the roots as they need it. That is why you can depend on Premier to give you:

HEALTHIER SOIL
MORE ROOTS
STURDIER PLANTS
SAFER TRANSPLANTING
PROTECTIVE MULCH

Remember, your garden can be no better than your soil. Start *now* to improve *both* with Premier Peat Moss. Ask your dealer today for Premier—identified by the *blue* bale head with certified seal.

PREMIER Certified PEAT MOSS

PREMIER PEAT MOSS CORP.
535 Fifth Ave., New York 17

PREMIER PEAT MOSS

PLANTS GROW BETTER in SIFTED SOIL

THE SOIL SIFTER

will give you better results in your flower beds, seed flats, hot beds, cold frames, potting house, etc. For spreading fertilizer, too. Green enamel, welded steel construction. Holds 30 lbs. Fine or coarse mesh. (Please specify on order) **$1.35 EACH $2.65 for set of two.** No C.O.D.'s please. Immediate delivery. Postpaid east of Mississippi. Add 15c each west of Mississippi.

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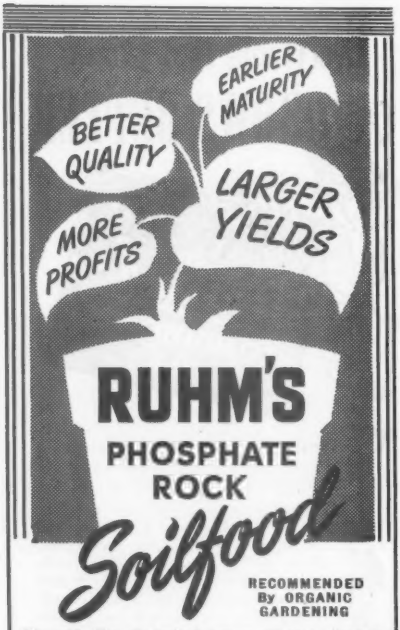

Non-acid. You can apply it now or any time—direct to soil or to the compost heaps. There's nothing like this ground-finer-than-flour natural brown Tennessee phosphate for combined low cost, easy handling, quick results and long lasting effectiveness. For full information write

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AUSTIN FEED & SEED CO., Chattanooga, Tenn.
VAUGHAN'S SEED STORE, 601 W. Jackson Blvd. Chicago, Illinois

Atkins & Durbrow

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ATKINS & DURBROW, INC.
165 JOHN STREET, NEW YORK 7, N.Y.

Manufacturers of DRICONURE for 20 Years

spring we lined it up for five rows of corn, sprinkled a little compost along the lines, mixed it in just a little along the row leaving the hay between rows untouched. The corn came up very quickly, grew rapidly, had a most wonderful healthy green color, and bore lovely large sweet well filled ears. We are completely sold on Organiculture. Our garden is now being made ready for another covering of alfalfa hay, leaves, etc., to winter over for spring planting.

Miss Irene Armitage,
P. O. Box No. 109,
Loma Linda, Calif.

—o—

NEEDLESS WASTE

Dear Sir:

There is a matter of which I think it necessary to write a paragraph or two about in your magazine, i.e. the (Waste King) pulverizer used for the crushing and pulverizing of (so called) waste matter from the kitchen. It is not so much the action of this machine as the fact that in the result of so doing it aids the wastefulness of our modern times in that it is a method of sending down the sink drain, so much good organic matter. I would like to own one of these pulverizers but if I had one would make sure that the vegetable and animal matter that

IODINE DEFICIENCY → Serious In Many Localities

No ordinary fertilizer—organic or otherwise contains specifically any extra iodine—that's why

SOILORG Sea Kelp Wheat Germ Mix

proves specific boon to organic gardeners as it offers an abundance of organic iodine from sea vegetation plus nitrogen and other minerals from wheat germ for the encouragement of WORM LIFE.

2 lbs. $1.00 5 lbs. $2.00

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Bird Chrysanthemums

Early flowering pompons

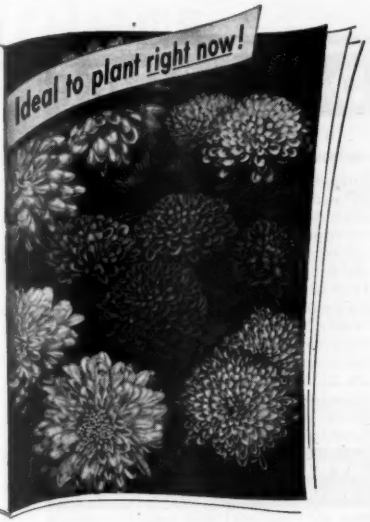
Pot Grown for strength and vigor

This strain is exclusive with Peter Henderson; starts blooming in early September. The colors clear and beautiful. Will bloom strongly this year. Your choice of these fine varieties; **Robin**—bright yellow to deep crimson center; **Snowbird**—lovely frost white; **Oriole**—clear yellow; **Lark**—Rosey blush-pink; **Tanager**—Rich deep red; **Thrush**—golden yellow tipped with red bronze.

Price: 3 for $1.00 - set of 6 - $2.00
One Dozen $3.75

(Add 10% to your order to cover packing and shipping)

Peter Henderson & Co.
86 Henderson Bldg.
35 Cortlandt St., N. Y. 7, N. Y.



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100% PURE WORM CASTINGS

Nature's best food for all varieties of indoor & outdoor plants.

Clean . . . odorless . . . easy to use. Contains no inorganic chemicals . . . just pure worm castings. Promotes more luxuriant foliage and stronger growth. Will not burn or harm tender seedlings.

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Limited Supply. Max. 12 tin limit

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Shiny aluminum strips crackle and flash. Keep birds or animals away day and night. Lasting protection for gardens and farms. Simple to use. Ask your dealer or order direct.

PACKAGE OF TEN **25¢**

FOUR PACKAGES 1.00 POSTPAID

SCARE-AWAY
DONAXE CO.
305 N.W. 12th Ave., Portland 9, Ore.

SAVE YOUR KNEES!

These comfortable sponge rubber knee pads are ideal when "setting out plants". Protect knees, trousers. Form-fitting, adjustable. Sorry, no C.O.D.'s. Prepaid, PAIR..... **$2**

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House & Garden Store
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DRICONURE

... a blend of Peat Moss, animal and poultry manure.

Favorite of gardeners for more than 20 years. 100% organic. All plant food and humus... no weed seeds... no filler... no waste. Holds plant food in liquid form so roots can use it as needed. Never burns. Produces more luxurious growth. 7½, 25, 50 and 100 lb. bags from your local dealer or direct. *Send for literature.*

ATKINS & DURBROW, INC.
165 JOHN STREET, NEW YORK 7, N.Y.
Oldest and Largest PEAT MOSS Producers in America

went through it should be by-passed into a container where it could be drained of excess water and run into a container for subsequent use as matter for the compost heap.

C. A. King
P. O. Box No. 477
Kelsa, Wisconsin

—o—

THOSE HYBRID WORMS

Dear Sir:

As a matter of fact an "economic zoologist" on the staff of one of our outstanding universities has stated: (In his opinion) "There seems little doubt that these earthworms (so-called hybrids) represent some modification of species. The transverse bars are very characteristic of the manure worm but on the other hand the manure worm does not attain the size of these."

The Arizona Earthworm Farm
Bertha Stevens
120 West Missouri Ave.
Phoenix, Arizona

SCOTCH MANURE (KELP)

(Takes approx. 10 tons wet kelp to make 1 ton dry kelp).

Has approx. 5 times more organic matter or elements than any other manures. Activates composting (neutralizer) cleaner and weed-free for mulching

Baled dried-Kelp—$4.00 per 100 lbs. or $60.00 per Ton. (F.O.B. Shipping Point)

Pacific Ocean Giant
KELP
Organic Products

Dehydrators - Processors

P. O. BOX NO. 531, DEPT. 1
SANTA BARBARA, CALIF.

RANCHERS FARMERS NURSERYMEN

Phosphate Rock Users Alternate with kelp or 400 lbs. to 1 ton of Phosphate Rock. Analysis Dried Kelp-Approx. (3-2-15) (Organic Matter Approx. 70%) Plus 27 Trace Minerals.

Our Western (Black) Phosphate Rock (32% P_2O_5)

200 Mesh Contains higher % of Trace Minerals

$2.00 Per 100 lbs. Sack or $30.00 Per Ton ....

1. U. of Calif. Ag. Bul. No. 248—"Dried Kelp contains less sodium chlorine salts than most (Kanit or Muriate) commercial fertilizers."

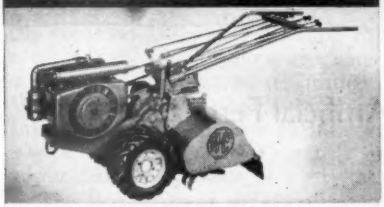
2. National and State Researchers to date disclose Kelp has radio-active (Sodium, Phosphorus, Potassium, Iodine salts necessary to combat diseases.
Soil (Plant, livestock, Humans) Source of our ills, aches and pains (Malnutrition)

3. Feed Stores suggest (Pulverizing Kelp) supplements in mixed livestock feeds (Dried Kelp has approx. 800 calories per lb. and Vitamins A-B-D-G.)

4. Health Stores suggest (Substituting Kelp for Salt in seasoning at table or in cooking) Supplement for human consumption.

Demand has been so great for Kelp Products. Our plans are to increase tenfold production (Harvest 360 days per yr. May take 3 mos. to fill new orders. —Organic Gardeners are firsts on our lists.)

USE NATURE'S WAY
...TO RECONDITION YOUR SOIL
...TO INCREASE CROP YIELD



M-E ROTARY TILLAGE MULCHES VEGETATION INTO SEED BED...

RECONDITIONS SOIL . . .
INCREASES CROP YIELDS

4 or 6 sets on each Patented Tine Unit

Use it spring, summer, and fall to rebuild soil Nature's way by cutting and mulching vegetation throughout tilled depth. This aerates soil, leaves it humus, improves moisture and mineral content, requires less fertilizer. And M-E Rotary Tillers have extra mechanical advantages: 4-cycle engines on all garden models . . no tine breakage . . precision-built.

G-16

Power Take-Off Models Also Available

Ask your dealer for free demonstration or write today.

Patents Pending

Milwaukee Equipment Mfg. Co.
Dept. DG-5, South Milwaukee, Wis.
Please send me illustrated folder, prices, and name of nearest M-E Rotary Tiller dealer.

Name.....

Address.....

ROTARY TILLERS
MILWAUKEE EQUIP. MFG. CO.
So. Milwaukee, Wis. U.S.A.

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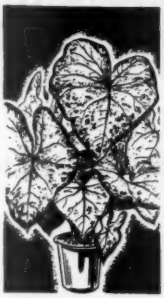

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Is Cancer Related to Artificial Fertilizers?

FIRST let us look at our problem. Is there a problem? How prevalent is cancer? Here are figures showing how many persons per 100,000 population in the U. S. died of cancer from 1900 to 1947:

1900	64
1910	76
1920	83
1925	92
1930	97
1935	108
1940	120
1945	127
1947	132

An analysis of these figures should make one question the oft-repeated statements one encounters in newspapers, magazines, books and the radio, that the mortality figures show that we are getting healthier and healthier. Every year shows a small but persistent increase over the preceding year. It is an increasing tendency that shows no desire to let up. When I bring these figures to the attention of physicians or to laymen the invariable answer is that these cancer statistics are misleading. They say that due to better diagnostic techniques more and more cases show up in the statistics which were formerly attributed to other diseases. Therefore it must be expected that the figures *will* show an increase and that we must not be alarmed about it. However, *that* excuse has now been worked threadbare. I have heard that argument for the last twenty years, but anyone who will investigate will find that while that may have been true in 1910 or even in 1920, since then diagnoses has made so much progress that around 1930 to 1935 it had become more or less perfect and the medical profession became proud of their brilliant achievements in this field. Read the cancer journals. I bow humbly to medical genius in bringing this about, so that for all practical purposes we reached a point, let us say, ten to fifteen years ago when diagnosis improved to such an extent that any further improvement would show up only in tiny, fractional decimal points.

Is Life Expectancy Increasing?

Another reason is given, that since more persons are attaining to a higher age, and that since cancer is a disease affecting older persons, naturally it would be expected that there would be a gradual increase in cancer deaths per hundred thousand of population. There are two parts to this assumption and both are incorrect. First, are there really more older persons? The mortality figures are only figures and sometimes figures can be misleading. Do we really have a greater life expectancy? *Time Magazine* of Dec. 4, 1944 said: "In the past 44 years past-65 life expectancy has increased only slightly. Women (white) of 65 can now expect to live a year longer than they could have in 1900; male expectancy has increased only half a year." This apparent discrepancy between the actual and what the public thinks is so, has to do with babies that used to die due to poor hygiene. It is due also to other conditions that do not affect *you*. You are not a baby that died in child-birth or in the first few years of life.

Cancer is not Caused by Old Age

The second error is the supposition that cancer is a disease of old age. Then why did the Metropolitan Life Insurance Company say the following in a release to the press February 18, 1949? "With the virtual conquest of the common childhood diseases, cancer now ranks high among the causes of death of youngsters, according to the statisticians of the Metropolitan Life Insurance Company. In the company's experience, cancer recently has accounted for one out of every nine deaths from disease at ages 1 to 14 years, while as late as 1930 the ratio was only one out of every fifty. Since that year the death rate from cancer among children insured in the Industrial Department has increased about 40 percent."

Professor Hoffman who is mentioned later on in this article said in the book there quoted: "After many years' thoughtful consideration and exhaustive statistical study, I am fully convinced that the apparent increase in cancer is real, and not to be explained away by changes in the age or constitution, or improvement in diagnoses." Nothing will be gained by arguing. Let's tackle the problem and argue afterward. We must realize that in the civilized world today we are in the midst of a dread curse and American brains must do something about it. When we are faced with figures which show that from Pearl Harbor to V-J Day 294,476 American soldiers and sailors were killed, but that during the same period 607,193 Americans died of cancer, we can better visualize what the cold cancer statistics mean, and that it is an emergency situation, a crisis, which demands bold, aggressive treatment. A statistician studying the trend of these cancer increases must come to the conclusion that if the tendency is not curbed half the population will be killed off in the next fifty to a hundred years.

Prevention or Cure?

The medical profession is confident that one of these days they will come up with a cure. But suppose cancer is different and does not respond to man's attempt at curing it? Isn't it time that experiments in prevention are attempted? It is the belief of many physicians that the quality of our food has a great deal to do with the incidence of cancer. The physicians who are high up in the brackets of medical controls must not rule out this possibility. A controlled experiment, supervised by the medical profession must soon be organized. If the concept that food from organically fertile soil can prevent cancer is wrong, such an experiment would soon find it out.

I would like to mention the work of the late Dr. Frederick L. Hoffman who was connected with the Prudential Insurance Company of America and with the Biochemical Research Foundation of the Franklin Institute of Philadelphia. He was a medical man of high repute who traveled all over the world studying cancer to see if he could obtain a clue to its causation. He devoted his life to it. In 1915 The Prudential Press published his book of 826 pages entitled, "The Mortality from Cancer Throughout the World." In 1937 The Williams and Wilkins Company, conservative medical publishers of Baltimore, Md., published his 767 page book called "Cancer and Diet," in which he quotes much evidence and the work of many physicians who hold that diet is an important element in cancer.

Very early in the book Dr. Hoffman becomes suspicious of commercial fertilizers. I am going to quote from his work:

Artificial Chemicals and Artificial Foods

"The food supply for this population (alluding to urban communities) is therefore naturally becoming more and more artificial and modified by a wide range of processes, some of which unquestionably react injuriously on the human organism. There is another factor involved to which hardly any attention has been called and that is the nature of the food supply itself which is being altered as the result of alterations in the nature of the soil

in which the food is raised. This applies particularly to the composition of the mineral constituents of the soil which to an increasing extent are being modified by the addition of artificial fertilizers which also are becoming more and more chemical and artificial in contrast to the use of natural manures in the earlier days, when the soil retained most of its original fertility and growth producing capacity. In other words any one of the principal food products consumed at the present time does not by any means represent the same natural mineral composition of say fifty years ago. . . .

"Granting that the prevention of soil exhaustion is the function of fertilizers, the effect of chemical fertilizers on human consumption has attracted little attention. Since our body is precisely what it feeds upon, chemical alterations must have affected human development and biological activities to an extent well deserving of more thoughtful consideration. The composition of foodstuffs now raised for farm animals has for many years received close attention but the chemical composition of human foodstuffs has been treated with indifference. We are still of the belief that it is immaterial from what soil or sources our foodstuff is derived although the evidence is overwhelmingly to the effect that measurable differences occur which may have serious consequences when the process is extended over a life time.

"As the result of the introduction of chemical fertilizers there has been a marked increase in the crop production. The average amount of wheat in bushels per acre has increased from 9.9 in 1886 to 16.2 in 1931. (Editor's Note—On our farm under the organic method, in 1948 we obtained 22 bushels to the acre. The average for our region was about 16.) The relative yield per acre varies, of course, widely for different sections of the country, having been as high as 28 bushels in Arizona and as low as 5.3 bushels in North Dakota. These figures are for 1931. It is reasonable inference that the nutritional qualities, particularly mineral content, must vary proportionately to the use of chemical fertilizers in different sections, but I am not aware of any data to substantiate this conclusion at the present time. What is true of wheat is true of other grains or vegetables that enter into the food consumption of the American people. Everywhere efforts are made to increase the yield per acre but what the effect of this hazard is on the mineral or vitamin content of the food is not revealed.

"The foregoing conclusion can also be applied to animal husbandry and dairying. It is to my mind an open question if there is not a substantial difference in milk supplied by cows artificially stimulated to a milk yield far above the average. Again the same conclusion may be applied to artificially fed steers and pigs."

All of the above shows independent, creative thinking, for it was written long before Sir Albert Howard's writings were available to the public. Dr. Hoffman quotes from the Yearbook of Agriculture for 1932 to show that in the earlier days of the use of commercial fertilizers the product was not as concentrated and soluble as it later became, but was mixed with waste or by-products of industry, so that equal tonnages by weight would mean more chemical potency in the commercial product of the last twenty or thirty years. He then quotes from the 1932 Yearbook:

"The American farmer, in his agricultural operations, applies 8,000,000 tons of fertilizers annually. It is frequently pointed out that this is an average application of 40 pounds for each acre of land under cultivation in this country, as contrasted with 500 pounds for The Netherlands, where intensive farming is generally followed."

Artificial Chemicals and Incidence of Cancer

Dr. Hoffman did not attempt to discuss the effect of so much commercial fertilizers on the health of the people of The Netherlands so I looked up the comparative cancer statistics for the United States and that country taken

from Hoffman's book, "The Mortality from Cancer Throughout the World." Here are figures for 1900 and 1910:

	U. S.	Holland	Bavaria	Italy
1900 —	64	91	99	52
1910 —	76	106	113	65

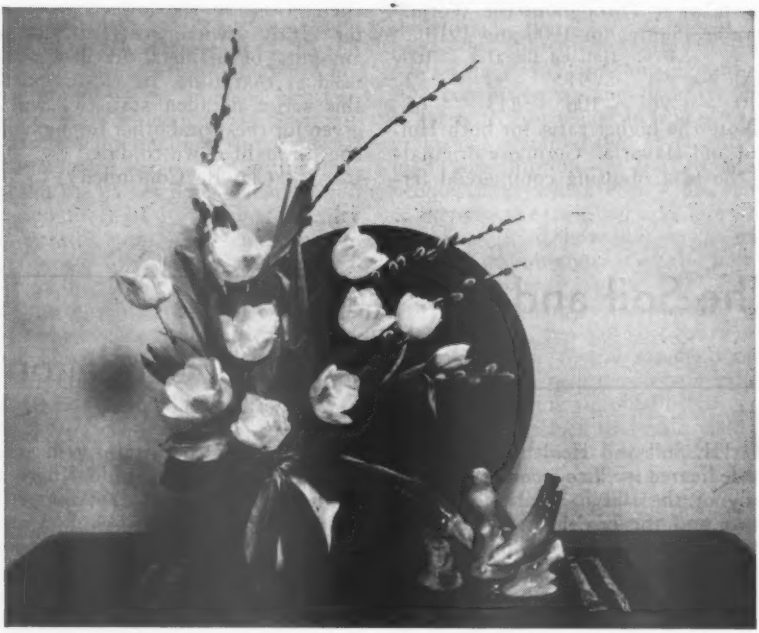
Note the higher rates for both Holland and Bavaria. Germany originated the idea of using commercial fertilizers and large tonnages are used there. Observe the lower cancer rate for Italy where extremely small amounts of artificial fertilizers were used at that time. In a later part of this series detailed statistics will be given for these and other foreign countries brought down to date.

(To Be Continued)

The Soil and Health Foundation

THE Soil and Health Foundation has dedicated itself to a comprehensive study of the soil in relation to food plants and the health and well-being of animals and man. All forms of life are machines which are made from elements which occur in the air in the form of gases and others which occur in the soil. The carbon and nitrogen are present in the air in inexhaustible amounts, but one or more of the elements in the soil may be deficient or entirely lacking. Soil scientists have become aware of soil deficiencies and have attempted to replace deficient elements by applying highly soluble artificial chemical fertilizers. The bad effects on the soil of such fertilizers could not have been foreseen. They form insoluble compounds with some essential elements in the soil and thus make them unavailable to plants. They contain a few of the major nutrient elements in such great amounts that they are absorbed by plants in excessive amounts and often unbalance the nutrition of higher plants. Because they are so highly soluble, often a considerable part of artificial chemicals are dissolved by the first rain and either carried out of the field in the run-off or leached into the lower soil layers where they are precipitated to form hardpans. Hardpans, in turn, interfere with the circulation of water and air in the soil and greatly decrease its productivity. The continued use of artificial fertilizers is accompanied with a gradual decrease in the amount of organic matter in the soil. As soil loses organic matter, it loses its value as a culture medium of higher plants. Humus is the spirit of the soil. It sees to it that plants take up just the right amounts of each nutrient element to insure the balanced nutrition of the plant. In the absence of sufficient humus, the metabolism of food plants is interfered with to such an extent that they may have some elements in excess while they lack more or less completely other elements which are essential to the health of animals and man using the plants for food. Such unbalanced food plants cause diseases in animals which have been referred to deficiency or degenerative diseases as cancer, multiple sclerosis, and mental sicknesses to mention only a few. Your attention is called to the Editorial in this issue, the first of a series pertaining to cancer and its probable causes.

The Soil and Health Foundation laboratory has been equipped and we are looking forward to securing the services of a well-trained biochemist to begin the experimental work. We need contributions from all interested persons to get the experimental work started. Send your contribution to The Secretary, 46 South West Street, Allentown, Pa.



TULIP ARRANGEMENT

•

by
Mrs. Robert L. Schaffer

•

photograph
by
Robert Rodale

•

The large sable-hued disc is an effective and lovely background for the delicately tinted tulips, with their subtle green leaves and tender stems.

Contrasted to these are the deeper green, waxy textured leaves of the rhododendron, which form the base of the composition.

The pussy willows add a dramatic note by emphasizing the graceful sweep of the tulips.

Three porcelain birds — harbingers of spring — balance the long, full curves and bring color and form to the foreground.

MINERAL RESOURCES IN PLANTS

DR. EHRENFRIED PFEIFFER

A CAREFUL study of the mineral elements present in plants, in roots, stems, leaves, fruit, seeds, reveals that the "organic" matter of living organisms is quite a source of almost every mineral element which has a bearing on life. Some time ago, the writer expressed this in a paradoxical statement, to the effect that by using all possible organic wastes deriving from plants, animals and bacteria one can provide all the mineral requirements of crops. But all compost is not yet enough to cover the organic requirements of the soil. It needs soil bacteria, fungi and earthworms to build up sufficient humus. With compost and manure added at a rate of 10 tons per acre we cover the mineral supply to a large extent. Ten tons of compost contain, on the average, 25% moisture, 25 to 35% mineral matter, the balance is organic matter. Earthworms alone, if present, produce 20 to 25 tons of humus per acre. Compost is food for microlife. This in turn produces humus. Compost, i.e., all organic products, is not a fertilizer in the sense of NPK (i. e. concentrated nitrogen, phosphate and potassium products). However, the microlife of the soil could not live in a concentrated fertilizer solution. It would starve, even as we human beings could not live on salt alone although we need it. The supply of trace elements through plants is, however, remarkable.

Mineral Content

The mineral content of a plant amounts to about 2 to 5% of its total weight. If the organic matter of the plant is destroyed by burning, ignition, then the ashes remain, consisting of all kinds of minerals. The ash analysis, therefore, reveals the mineral contents of plants. Ash analyses are troublesome and time consuming and it is only recently that one has found a shortcut for the determination of mineral contents through spectrographic methods.

If we know the mineral contents of plants then we can counteract deficiencies by adding specific plants to compost. Thus we can build a compost which is suited to any particular purpose. In the following, data are given which will enable our readers to improve their composts, to "know" their compost. It is not necessary that you use ashes, the whole plants can be used. We mention the ash content because it is merely a scientific custom to express the mineral content in terms of the percentage of the total ash of a plant. When you make compost this ash is contained in the decaying organic matter. All of the percentage figures are expressions of the percentage of total ash.

Let us begin with *potassium*. Roots of plants store quite a bit of potassium. Most roots have the highest potassium content when young and lose some toward maturity. The potassium content of leaves, especially of trees, increases toward summer and early fall. The potassium in turnips also increases with age. Since potassium is easily washed out, autumn leaves should be collected at once. If one desires a high potassium content in compost one incorporates as many green plant parts as possible before they have dried out or leached out. Tomato foliage, beets, wild parsnip, chicory, wild carrot (roots), lettuce, potatoes

(tuber 60%, foliage 27%) have a high potassium content (53 to 60% of the ash); rape, and sunflower a medium content (40 to 50%). The common bracken or brake fern has even been "mined" because of its high potassium content. Dutchman's Breeches and wormwood are two weeds indicating the presence of much potash in soil. Tobacco, apricots, coffee beans (use the grounds), and plums belong to this group too. Grasses and clovers have a content ranging from 25 to 40%. Beech leaves and the sawdust of the beech are especially high in this element. In the wood of trees, the highest potassium content is usually found in early spring, the lowest during summer. Besides beech sawdust, oak, walnut and fir rank high, while birch and others contain much less.

Lime or calcium: Here we must differentiate between plants which indicate or prefer lime in a soil or dislike it and those which have a high calcium content. In the ashes of old beech leaves we find 33 to 42% calcium, in the bark 40 to 70%. Yet the beech could not be called a lime indicator even though it prefers limestone soils. The list of calcium preferring or calcium avoiding plants is so large that a special article will be devoted to this subject at a later date.

Quite a few plants are indicators of the presence of certain elements in soils and absorb and accumulate them. With recent improved techniques of spectrographic analysis this study has been much enlarged and one now knows that many elements can be found in traces in almost any location which have no direct relationship to the underlying soil or rock. Some of these elements have an essential biocatalytic value as previously reported by the writer in *Organic Gardening*. The value of others has not been discovered.

Barium, for instance, is found in some wheat, in tobacco, and up to 1% of the ash of beech wood consists of it. In Colorado, the Loco Weed (*Astragalus mollisimus*) indicates barium containing rocks. Livestock which eat this particular plant for an extended period are poisoned, while the traces in other plants do not harm them. With our present knowledge of radioactivity, barium may be considered as a remainder of a radioactive process which has come to an end.

Strontium is frequently found in sugar beets. Although it has no evident physiological role its absence in the sugar beet may indicate that a soil is depleted.

Dolomite is a mineral which contains magnesium and calcium carbonate. It is a better balanced fertilizer than lime. That is why we always recommend the use of dolomite in preference to liming. Liming alone can cause caking of soils, precipitation of magnesium and other undesirable symptoms while the use of dolomite avoids these. Plants which indicate dolomite in soils are: Monkshood (Aconitum) a poisonous medicinal herb. Creeping Bugleweed (Ajuga genevensis), mountain oats, Bellflower (Campanula sativa), Willow Grass (Draba stylaris), Spotted Spurge (Euphorbia platyphyllos, Pearl Plant (Lithospermum), Fringed Orchis (Orchis variegatens), Plantain (Plantago serpentina), Rough-Stalked Meadow Grass (Poa trivialis), Rue (Ruta graveolens), Bristly Sage (Salvia verticillata), Rockfoil (Saxifraga stenopitala), Meadow Saxifrage, Creeping Valerian, Veronica.

Magnesium is accumulated in Tobacco (up to 15%), Clover (17%), Chick Weed (Stellaria media) (22%), Solanum tuberosum, similar to potato, (leaves and stems 28%, flax (10%), Holly (Ilex aquifolia) in the leaves 20%. Magnesium is essential for chlorophyll production. Sea Plantain (Plantago maritima) and Sea Primula (Glaux maritima) indicate sulphate of magnesium and grow near the sea shore.

Zinc is frequently found as a trace in citrus trees. Yellow violet (Viola calaminaria) and purple violet (Viola lutea) and Sand Cress (Alsine verna)

grow near zinc mines. These as well as Rock Cress (Arabis) accumulate zinc in their leaves up to 13%, Penny Cress (Thlaspi calaminare) has up to 21%. Knot Grass (Polygonum ariculare), Shepherd's Purse and Coltsfoot, and to a certain extent also dandelion, accumulate zinc and are, therefore important compost weeds in case of zinc deficiencies. Zinc is also found in corn, wheat, vetch, beech and fir trees and birches. Its absence would again point to a total deficiency.

Copper is accumulated by Sand Cress as is zinc. It is also found in the seeds of the cocoa, and in beans (1 to 20 parts per million). In Australia, prospectors look out for a handsome tree, Polycarpacae spirostyles, as a sure indication of the presence of copper ore. Common weeds, like knot grass, wild carrot, and wild lettuce are rich in copper. Yellow lupin and vetch may contain 0.03%; barley, peas, soyabeans, lentils 0.01%; wheat 0.07%, leaves of the grape vine, figs, plums, beets, chicory, oak, mulberry, linden, sycamore (oakwood three times as much as the leaves), spinach and clover contain traces of copper. Thyme and dandelion contain 0.02 to 0.03%, buckwheat 0.8%, beech 0.1%. Beech and oak sawdust seem to be a valuable source of many trace metals.

Silver: Traces of silver have been found in organically grown wheat and corn. In Montana, silver ore has been discovered where Wooly Buckwheat (Eriogonum ovalifolium) grows.

Algae, particularly those of salt water origin, contain silver, copper 0.005%, iodine 0.18%, chromium, manganese 0.09%, cobalt 0.003%, calcium 4%, magnesium 0.7%, potassium 11.1%, sulphur 1%, in addition traces of barium, boron, lithium, nickel, titanium, vanadium and zinc. Kelp is, therefore, one of the ideal raw, organic sources of trace elements. In passing, it may also be mentioned that kelp contains riboflavin, niacin, and carotene, all essential vitamins.

Gold: Some plants even contain gold. Some years ago, a swamp horsetail, or Equisetum, which grows in Bohemia, was noted as containing appreciable amounts of the precious metal. Timber in New Zealand and Australia growing near gold veins is rich in it. There has also been observed a specific vegetation of shrubs near gold bearing streams in California.

Aluminum: In the form of clay or loam, aluminum oxide exists almost everywhere. As a soluble salt it is supposed to be harmful. With a few exceptions, plants in general do not accumulate aluminum. One of these exceptions is Club Moss or Ground Pine which bears a large amount, up to 25%. A bacterium Crenothrix also accumulates aluminum. Aluminum compounds have an influence on the color of Hydrangea blossoms, a fact which is used by some gardeners, for alum sulphate and iron sulphate turn the pink color to blue. Aluminum has a specific preference for certain plant organs, while in other parts of the same plant it is absent. The sterile leaves of ferns contain none, while the spore bearing parts are rich in it. The seeds and calyx of Jacobs Ladder are negative, the epidermis of the stems is rich in it.

Thallium has been found in fodder beets, and in the sap of grapes from where it is precipitated into the yeast residue after fermentation, also in chicory, tobacco, beech wood and kelp.

Tin: The Star Flower (Trientalis europea) indicates tin ore as does a sedum (Sempervivum soboliferem). It has been found in beech, fir, oak and beech wood, although the writer has not come across it in any American plants.

Lead is frequently found in traces in cultivated plants like corn and wheat. In Michigan and Wisconsin the Lead Plant (Amorpha canescens) a legume, indicates lead sulphide ore as do the Laurel and Sassafrass in Missouri. The Bent Grasses, willow wood and roots accumulate it. Lead in soils may cause dwarfing.

Manganese: Beech leaves contain manganese (11%), birch sometimes as much as 14%. Norway Spruce (Picea Abies) tops the list with 35% in the needles, 41% in the bark. Fir wood contains 28%, the bark 40%. Where manganese is prevalent in plants there is usually a low iron content. In grain, manganese is fixed on organic acids; tea is very rich in it (up to 10% of the ash), then follows coffee and cocoa (use coffe grounds and tea leaves for compost). Mangels, carrots, chicory, parsley, sorrel, and white lupins (leaves 8%) contain manganese. It can even be found in milk, egg yolk, and honey. The bacterium Crenothrix collects manganese and iron. Conifers accumulate more than deciduous trees. The maximum is found in young leaves, then there is less and in very old leaves there is again a maximum. Physiologically, manganese seems to reduce the moisture content in plant tissues.

Iron: The weeping birch (Betula verrucosa) prefers iron soils. The Jesuit Chestnut (Trapa natans) shell 68%, oak wood 66%, both accumulate iron. Quite a few bacteria oxidize or reduce iron, among these are Leptothrix, Crenothrix, Cladothrix. In general, plants contain little iron, even spinach and cabbage boast only 0.04%.

Cobalt and Nickel: Nickel has been found in traces in wheat, corn, in oak wood, in mosses, buckwheat, tomatoes and peas.

Phosphorus: This element is necessary to all plants and plays a role in the production of seed proteins. Onions particularly the wild, buttercup, anemones, black nightshade, Common Groundsel, cucumber, wheat, Black Henbane, olive (seed), tea, buckwheat, corn, almonds, rye seed, and rice accumulate large amounts. In Spain, a bindweed (Convolvulus) indicates phosphate rock. Along the Elbe, near Hamburg, Germany, a fresh water herb (Stratiotes alismoides) contains so much phosphate that it used to be collected for use as a phosphate fertilizer. The phosphate content in plants increases toward blossoming and then comes to a halt.

Arsenic is not desirable; is exists in traces here and there. Rutabaga and Magnolia accumulate it without damage. This might suggest the value of planting these in orchards which have been excessively treated with arsenic sprays in order to remove the excess. Cattle grazing near the Anaconda mines have been poisoned by the arsenic which had been naturally absorbed by the grass. In parasitic plants, such as fungi, it also accumulates. When penicillium brevicaule grows on a soil or media containing arensic it exhales a typical odor of garlic.

Titanium is frequently found in traces in medicinal herbs, weeds, grain, potato leaves, sugar beets, especially in apple trees. Clay soils contain more than any others.

Vanadium is frequently encountered in traces especially in sugar beets, mangels, grape vines, beech and oak.

Boron: Small amounts are found in the fruits of the quince, apple, pomegranate, and the medlar, especially in California wine, in hops, in berries, iris, sugar beets and mangel leaves.

Iodine is usually not encountered in land plants with the exception of traces in mangels and beets, tobacco, coffee, certain peats, much in algea, kelp and many lower animals like the corals, sponges, oysters, frogs, crabs, star fish and certain centipedes. If a soil is rich in iodine, for one reason or another, nearness to the seashore, for instance, it will be found in the cultivated vegetables too.

Fluorine: Faint traces are found here and there, especially in grapes and Sand Cress.

This whole list is by no means complete. Much future research may reveal a lot of other native and cultivated plants which may also be of importance as sources for minerals.

Lilies are Easy to Grow

By A. W. FORBES

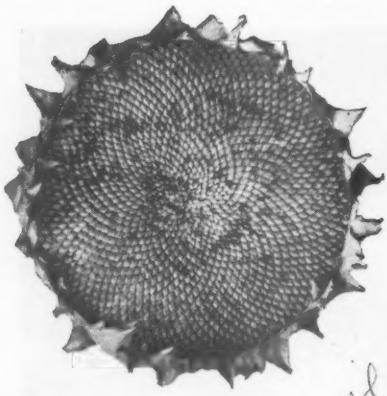
BUT some lilies are much easier to grow than others, some are much easier than the methods described by Julie Bedier in the October issue of *Organic Gardening*. Among the easiest to grow as well as the most beautiful are the Regal lilies. So I would like to tell my experience with these.

In a special five cent collection of flower seeds were a few seeds of the Regal lilies, but not having a place to put them in the flower garden, I planted them in a row among the vegetables. The second year a few blossomed, but the third year I wanted the space for vegetables, and so I dug them up. But they did not mind. They grew where they landed, and continued to bloom.

For about ten years now they have been growing among the corn, beans and tomatoes, without any care, other than what was given to the vegetables. The flowers seem as choice as any, and while care might produce a greater number of flowers on one stalk, no care produces an average of five or six flowers to a stalk, with sometimes as many as twelve. In preparing the soil for the vegetables, I often fork up some bulbs, but in that case, I merely cover them wherever they may be, and it does not seem to trouble them any.

At the same time the lilies do not seem to detract from the growth of the vegetables. This year one stalk of corn came up by a cluster of lilies, five stalks of lilies carrying thirty flowers, and one stalk of corn, all within a five inch circle. But this stalk of corn was the most vigorous, and produced the earliest and largest ear of any in that row. I will not claim that the lilies increase the vegetable crop, but I have not seen any indication that they reduce it. When in bloom this year they were just a little taller than the half grown corn, which gave quite a different appearance from the usual garden of corn. And at the same time we had all the lilies which we wanted for home decoration.

While these Regal lilies are as easy to grow as anything could be, they have two requirements, and if there are any others I have not discovered them. The soil must be well drained and must have an adequate supply of organic material. But these are also needed for vegetables. The lilies require nothing additional.



SUNFLOWERS
EARN THEIR PLACE IN THE SUN

By Gurnee (Mrs. Wm.) Williams

THIS morning we were late restocking our bird feeder, and the absence of sunflower seeds caused considerable consternation among the titmice. Actions and voices reproached us. Toughie Titmouse, the largest of the species we have ever known, was flexing his feathers and acting particularly belligerent even for a particularly belligerent titmouse. There wasn't a happy bird in the lot; they were all impatient, fussy, demanding and—irresistible. As soon as sunflower seeds begin to form these greedy, grey-tufted little birds arrive by the score to cling to the swaying flower heads. They are often joined by the equally delightful, equally hungry goldfinches. Playing "ant" to their "grasshopper-like" living, we store a quantity of the seed heads for winter, and, again, it is the titmice who are first, and with most persistence at our window feeder. As I write I hear the tap, tap, tap of a titmouse shucking a sunflower seed. He has carried his favorite food to the rim of the feeder, placed it between his feet and with great rapidity, with a kind of air-hammer technique he is drumming away at the tough, striped hull. The noise ceases. He will have pierced the covering, extracted the mat and dropped the hull. Right now he is most likely hopping around on the feeder making another selection. Charming fellows the titmice and well worth their overhead, but they are smart as well as charming because, nutritionally, sunflower seeds are tops!

With high protein foods available to only about 60% of our population, due to their cost, that which holds promise as a protein supplement has about won its place in the sun for that alone. Mr. Rodale's comments in *Organic Gardening* about the value of protein rich sunflower seeds may have been the first such information for many of us. Certain of the facts are important enough to bear repeating. The value of proteins in food in human and animal nutrition is dependent upon their digestibility, and a high proportion of the proteins in sunflower seeds and sunflower seed flour and meal has been found to be digestible. In fact, this proportion is high enough to class sunflower seed products with those of wheat and oats, while its proteins are superior to those of corn. The protein content of sunflower seed flour is 52.8% as compared with 13.0% for wheat flour. It is rich in vitamins thiamine and niacin and high in calcium. It is easy to see, as a supplement to white flour, sunflower seed flour can correct many of white flour's deficiencies. As a meal, its properties make it a valuable protein supplement in the feeding of animals and poultry.

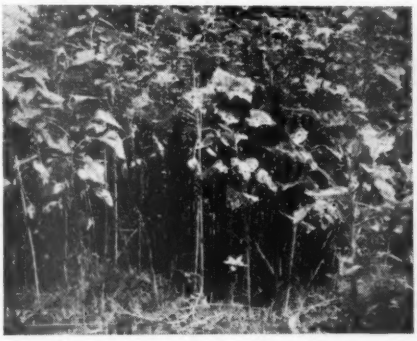
With the meat of the sunflower seed about 50% oil, it is gratifying to know the oil is considered to be of fine quality and desirable as salad and cooking oil. Then, too, it would be unfair to *Helianthus annuus* if we failed to mention its food value as a silage for livestock. Also, the sunflower is important from the standpoint of bee-keeping since it starts to bloom in mid-summer, when there is usually a shortage of honey-producing flowers, and continues to bloom until frost.

On our something-less-than-three acres the sunflowers are among the most popular and attractive plants. Of course, one reason for our liking them is due to the care they don't require.

At different times, where we have wanted certain spots shaded, we have scattered a few Russian sunflower seeds, but other than that both the Russian and native sunflowers have come up year after year from seeds dropped by the birds or from those which escaped our harvest. Each year an untilled slope is host to hundreds of young seedlings. We start thinning them as soon as they are large enough to make a contribution to our compost box, and what a contribution it is! In 4" to 8" lengths sunflower plants go from chopping block into compost box where their addition to fine grasses weeds, etc., is just what is needed for aeration, texture, bulk, and, we suspect, other desirable compost properties. Throughout the summer and early fall the plants are cut down as they become crowded and as we need coarser material for composting. In thinning, lanes are cut through the plants until they eventually grow in rows and we can run through them with our garden tractor to keep down the weeds. So tall and straight they stand topped off with their round seed heads surrounded by petaled frills of yellow and orange. This height, their big leaves and the bright splashes of color create something of a tropical atmosphere. The buzzing bees, the peto, peto, peto of the feeding titmice and the per-chic-o-ree of the goldfinch add to an illusion so intriguing we often turn aside to walk through a shady sunflower lane.

Happy as the birds appear with their songs as they feed, popular as are the blooms with the industrious bees, useful and attractive as we find the plants, it is the earth itself which shows the greatest appreciation of the sunflower's worth. Cradling the seeds through the winter, nourishing the plants during the growing season (we must husband our compost for gardens and fruit so we are of no help) clinging tenaciously to roots that strong, hilltop winds would wrest out, the grateful earth presents to the birds, the bees, to us and, eventually, to our compost box, sunflowers larger than the year before. This year matured sunflower stumps (we used a hatchet to chop down the plants) measured up to 9" in circumference. Like many another, we aren't very articulate about the love for the soil and our desire to improve it, but when we see a grass or a plant, like the valuable, versatile sunflower, which also puts back into the earth more than it takes out, we are happy beyond belief.

The sun, it is said, is the sunflower's God, and we would be the last to say it isn't so, but we have discovered sunflower blooms do not always face the sun. We wish they did; it is a pleasurable sentiment, but, after all, it is an obeisance uncalled for because sunflowers earn their place in the sun in so *many* ways.



Sunflower plants are excellent green matter for the compost heap.

— ROBERT RODALE

Figure 1

A FERTILIZER EXPERIMENT

By DR. WILLIAM H. EYSTER

IN recent months there has been much discussion about the relative merits of various kinds of fertilizers for growing garden vegetables and field crop plants. The simple experiment here reported was carried out in the greenhouse of the Organic Farm where all farm crops and vegetables are grown without artificial chemical fertilizers.

The Soil

For the experiment, good top soil from a well fertilized corn field was used. This was divided into four equal heaps and treated with fertilizers as indicated under fertilizers below.

The Fertilizers

To one portion of the soil, compost was added at the rate of 5 tons per acre. This soil was filled into 8-inch pots and marked number 1. To a second portion of soil, earthworm castings were added at the rate of about 5 tons per acre. The soil with the earthworm castings was put into similar pots and marked number 2. To the third portion of the soil, a 4-12-4 commercial fertilizer was added at the rate of 1,000 pounds per acre. This was put in 8-inch pots and marked number 3. The fourth portion of the soil was used without fertilizers of any kind. This soil was put in pots and marked number 4.

Tomato Experiment

The tomato plants for the experiment were grown in a mixture of equal parts of soil, sand, and compost. The variety of tomato used was Stokesdale. The seeds were sown on September 25, 1947. On November 5 following, when the seedlings were 2½ inches tall, the plants for the experiment were selected. So far as possible, all plants used were of the same size and vigor. Care was taken that all plants used had a well-developed root system.

Throughout the growing period, all plants were given the same treatment. Each plant was given the same amount of water, and all plants were watered at regular intervals. Each planting was quadrupled.

Differential Growth Rates

Differences in the rate of growth of the plants growing in the different soils soon became apparent. The plants 3 weeks after the date of transplanting are shown in Fig. 1. Plants with compost are marked 1; plants with earthworm castings, number 2; plants with the 4-12-4 commercial fertilizer, number 3; and plants with the same soil as the other pots but without fertilizers, number 4. In all cases the plants with the commercial fertilizer, number 3, were smaller than any of the other plants. It is possible that the fertilizer

— ROBERT RODALE

Fig. 2. (1) Compost, (2) Earthworm, (3) 4-12-4 Fertilizer (4) Check — No fertilizer

proved injurious to the roots of the plants.

The same plants, photographed on December 10, 1947, are shown in Fig. 2. All of the fertilized plants grew more rapidly than those which received no fertilizer. The plants which received the compost grew more rapidly than those which received earthworm castings, and those which were fertilized with earthworm castings more rapidly than those fertilized with the 4-12-4 commercial fertilizer. The differences in growth shown were expressed in all plants in the experiment. All the compost-fertilized plants, for instance, were larger and more stocky than any other plants in the experiment. The size differences shown in Fig. 2 were rather uniform in the plants according to the fertilizer used, as shown in Fig. 3. These differences were maintained throughout the growth cycle of the plants. The rapid growth of the plants is indicated by Fig. 4 which shows the plants as they appeared on December 17 when the plants were one week older than shown in Fig. 2 and 3.

Data on Rate of Growth

At intervals between December 17, when the plants had attained the sizes shown in Fig. 4, and January 31, 1948, when the plants began setting fruits, the plants were measured for height of plant and diameter of stem near the ground level. The results of these measurements are given in table 1.

The first measurements were made on November 15, twelve days after the plants were transplanted to the pots. In all cases, the tops grew rather slowly during the first month. Evidently most of the plant's energies were expended in developing a strong root system. Beginning December 17, all lots of plants made more rapid top growth, but at different rates. The plants fertilized with earthworm castings grew more rapidly than all others so that they attained the same height as the compost-fertilized plants on January 31. Unfortunately measurements were discontinued after this time, but the earthworm castings-fertilized plants not only outgrew all

TABLE 1

Date of Measurement	*Composted Plants*		*Earthworm Castings*		*4-12-4 Fertilizer*		*Check No Fertilizer*	
	H	D	H	D	H	D	H	D
Nov. 17, 1947	3.75		3.75		2.75		3.25	
Dec. 10, 1947	13.00	0.31	10.50	0.30	8.25	0.25	6.10	0.12
17, 1947	16.50	0.37	14.50	0.32	12.00	0.31	8.00	0.20
30, 1947	26.00	0.39	22.00	0.36	21.00	0.32	10.00	0.20
Jan. 14, 1948	36.00	0.40	32.00	0.40	28.00	0.33	14.00	0.20
31, 1948	46.00	0.44	46.00	0.44	36.00	0.38	20.00	0.25

H—height of plant in inches
D—diameter of stem near the ground level.

— ROBERT RODALE

Fig. 3. Same plants as shown in Fig. 2.

other plants but also out-yielded the others so far as observations were made.

Data on Yield

The plants in the experiment began to set fruit near the end of January, 1948. The number of fruits which set was roughly proportional to the growth performance of the different lots of plants.

When the fruits were fully ripe, they were removed from the plants and weighed in ounces. The number of fruits and their weights from the various plants in the experiment were recorded. All fruits which ripened up to and including June 7 were carefully harvested and individually weighed. The weighings were discontinued after this date because a person not familiar with the experiment removed fruits from the plants for kitchen use. Also

TABLE 2

	Number of Fruits Set per 4 Plants	
	Jan. 31, 1948	Feb. 14, 1948
Compost-fertilized plants	11	49
Earthworm castings in soil	12	50
4-12-4 commercial fertilizer	9	38
Check—no fertilizer in soil	2	6

— ROBERT RODALE

Fig. 4. Size differences persisted until plants reached sexual maturity

visitors to the organic farm could not resist the temptation of tasting the fruits so that further weighings could not be regarded as of much scientific value.

Growth of Lettuce

At the same time and in the same kinds of soils as used in the tomato experiment, head lettuce plants were grown. The lettuce plants responded to the various fertilizers in much the same way as did the tomato plants, as shown in Fig. 5. Four plants were grown in soil fertilized with compost, earthworm castings, and a 4-12-4 commercial fertilizer respectively and four plants were grown in the soil without fertilizer of any kind. The differences in the rate of growth were amazing. The differences in the size of the plants were maintained until the plants were mature. The increased rate of growth and the larger size of the plants grown in the soil fertilized with compost and earthworm castings are so outstanding as to recommend these fertilizers to the home gardener and the commercial grower.

Deficient Elements. Essential elements which are known to be deficient in the soil are supplied with the compost. As sources of deficient elements which may not be present in the soil and therefore not in the compost made from plants grown in a soil, Organic Gardening recommends such natural products as finely ground limestone, pulverized phosphate rock, seaweeds, pulverized glauconite, or other rocks which contain the deficient elements in insoluble form. The phosphoric acid in phosphate rock, for instance, becomes soluble in the soil in sufficient amounts to take care of the needs of the plants. The same is true of the other natural products used as sources of elements which may be deficient in the soil. The compost used in these experiments was made with pulverized limestone and phosphate rocks.

The objections to using artificial chemical fertilizers are associated with their high solubility and their content of ions which cannot be used by our crop plants, as sodium in sodium nitrate and sulphuric acid in superphosphate. Because of the high solubility of artificial chemical fertilizers, the following undesirable conditions arise: (1) Food plants absorb ions from the highly soluble artificial chemical fertilizers in such excess as to unbalance the metabolism of the plant and become toxic to the animals eating the plants. An example of this is provided by the nitrates which cause hemoglobinemia in infants. Professor J. K. Wilson of Cornell University suggested that the nitrates from the soil are reduced in the plant to form the toxic nitrites. (2) Artificial chemical fertilizers, as sodium nitrate and superphosphate, are so soluble that they often are leached out of the surface layers of the soil and are either carried away in the run-off or are deposited in the subsoil as hardpans which may exist as a number of superposed and impermeable layers.

1 2 3 4

— ROBERT RODALE

Fig. 5. Lettuce responded like tomatoes

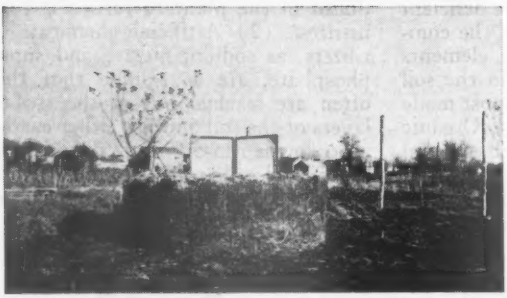
Compost

EXPERIMENTS IN COMPOSTING

by A. W. Rossiter

1. A piece of ground seeded with *winter vetch* in preparation for a tomato patch in 1949. The part of the patch in the foreground was mowed on November 11, 1948, and the picture was taken December 1, 1948. The cutting was made to learn to what extent the vetch could recover before winter if pastured mildly.

2. This is a picture of a project for convenient disposal of garbage. After the pile was built, the stakes and board sides were moved to the left two feet and the garbage was dumped into the space thus provided and the compost pulled over it. How far into freezing weather this method of garbage disposal can be used remains to be seen.



3. This picture shows a repiling of compost and new debris with manure, using a 32 inch chicken wire for a form. The form can now be removed to one side and the material turned over before winter.

4. This shows rye as a cover crop, planted in a three-inch layer of half-composted mulch in preparation for a 1949 potato patch. After three years of treatment (including a recent application of rock phosphate), the soil is becoming a thorough delight.

The Novice and His Thumbs

By LEONARD WICKENDEN

Author of "Make Friends with Your Land"

vegetable gardening

"YOU must have a green thumb," said one of my neighbors as he strolled with me around my garden.

What is this green thumb business? The suggestion seems to be that plants will grow for some people, but won't grow for others, and that the difference lies in some magic which emanates from the thumb of the successful gardener. If you are the lucky owner of one of these magic thumbs, your flowers will be lusty and bloom profusely, your vegetable crops will be vigorous, the tree in your orchard will be heavy with fruit. If your thumbs are just ordinary thumbs, nothing you can do will bring you success. Is this true or is the green thumb theory nothing more than a comforting excuse for failure?

To put the matter in a nutshell, I think it is more a question of black soil than of green thumbs. The basic requirement for producing superior plants is good soil. With fertile soil in good tilth, the veriest tyro can scarcely fail to grow either flowers or vegetables. He may not—indeed, almost certainly he will not—be as successful as the experienced gardener working with equally good soil, but if both of them have poor soil the expert will have but little more success than the tyro.

That statement seems so obvious as to be scarcely worth making, yet, time and again have I seen a hopeful citizen laboriously digging up a plot of land on which, the previous year, even the weeds had been sparse and sickly, and then trustingly sowing seeds of cabbage, lettuce, beans, peas and so on, down the list. When the scrawny lettuces bolted to seed before he could eat them, and the pea vines turned yellow and dried up, and the cabbage heads never grew bigger than his fist, he would sign dismally and say: "Well, I guess I don't have a green thumb."

When I told him that Luther Burbank himself couldn't have made a garden in soil like that he would answer indignantly that there was nothing wrong with the soil. He'd spread a bag of ground limestone and 50 lb. of 5-10-5 fertilizer, so the plants had everything they needed—calcium, nitorgen, phosphates, potash — everything. Yes *sir!* He'd put a *lot* of work into preparing the soil. *That* wasn't the trouble. It was just that plants wouldn't grow for him.

The faith that chemical fertilizers give the plant all it needs must have nipped the budding enthusiasm of countless beginners who have given up gardening in the conviction that their thumbs were not the right color. If you are a newcomer to the art and science of gardening, I beg you to forget your thumbs and to concentrate all your attention on your soil. Your thumbs are all right; your soil may be all wrong. But no matter how complicated some writers on gardening try to make it, the fundamental truth about soil, in ninety cases out of a hundred, is very simple. It is this: lacking sufficient organic matter, no soil can be good; if the soil is sour, it must be sweetened with ground limestone; in most cases, ground phosphate rock may be used to advantage; then, given sufficient organic matter of vegetable and animal origin, no other fertilizer is necessary.

How much organic matter is sufficient? The first thing to say in answer to that question is that, in any average soil, mineral matter so far outweighs organic matter (15 to 1 or more) that it is almost humanly impossible to add too much. The second thing is that a soil with sufficient organic matter is soft and resilient in the spring, crumbles in the hand under light pressure when baked in the summer sun, absorbs water so readily that it can be worked soon after frost leaves the ground, and holds water so tenaciously that plants growing in it can withstand drought for weeks. If your soil meets these specifications it contains sufficient organic matter, but that does not mean that it requires no further attention from you. Organic matter is rapidly consumed and you must work hard to replenish that which is lost.

I am told that in some parts of the United States conditions exist in which the soil, by thriftless cultivation, has been so exhausted of the supply of needed mineral elements that it is no longer fertile. Further than this, the character of the subsoil (which in most areas is an almost inexhaustible source of minerals) is such that the topsoil cannot be replenished from it. If the materials for compost are derived solely from vegetable matter grown on such soil and from animals fed on crops grown on it, obviously the compost itself will lack the needed elements. If such a case is encountered, the only completely satisfactory solution is the addition of finely ground native rocks containing potash, phosphates and trace elements.

It would seem to me that an organic gardener who found himself in such a situation would be a rare case. It must be recognized that the compost heap of the home gardener should not, and seldom does, consist only of the waste products of the gardener's own land. Onto that heap goes all of his kitchen waste that will decay, and this comes from the four corners of the globe: grapefruit peel from Florida, orange peel from California, coffee grounds from Guatemala and Brazil, tea-leaves from India and China, banana skins from South America, fish waste from the ocean, meat scraps from cattle-raising areas possibly hundreds of miles from his home. Even if he has livestock of his own, as often as not (perhaps more often) they are at least partly fed on grains and meal from other localities. All this food material will be bringing to his soil many different minerals, and since it comes from such widely scattered sources it does not seem unreasonable to assume that trace elements will not be lacking.

Given good soil, what other obstacles will contribute to the beginner's difficulties? From my own experience, I would list them in the following order

(1) *Location.* For most plants, and for nearly all vegetables, the best location is a well-drained plot with full exposure to the sun. That means that it should not be too close to buildings or trees and should not be swampy in spring or become water-logged after heavy rain. Many gardeners, especially those living in towns or suburbs, have to be satisfied with something less than perfection in these respects. Most town and suburban plots are reasonably well drained, but houses often cut off sunshine during part of the day or there may be large trees so near that they not only produce shade but rob the soil of moisture and nutriment. Where conditions are such that the garden gets only two or three hours of sunshine a day, the growing of most plants becomes so difficult that the wisdom of making the attempt becomes doubtful. On the other hand, if you can get sunshine for as much as half the day, you can get a measure of success sufficient to reward you for your efforts.

(2) *Seed-sowing.* All the beginners I ever knew, and most old-timers (including myself) sow seeds too thickly in the first place and lack the strength of mind to thin out the seedlings sufficiently. This trouble, I think, is almost entirely psychological. We are so anxi-

ous to see a full row of young plants that we pour in enough seed for a drill twice to ten times the length. When the seedlings finally shoulder their way through the crowd to the sunshine above, it seems such a cruel and wasteful thing to pull out nine-tenths of the hopeful infants that we compromise by leaving the survivors much too close together. So, as things turn out, we have three or four times as many stunted plants as we need instead of about the right number of noble, well-developed specimens. I know no easy cure for this form of mental disease.

(3) *Transplanting.* Every experienced gardener has his own pet method of transplanting and there is no one method which all gardeners would concede to be the best. No matter how carefully young plants are dug from the seed-bed, some break must occur in the all-important connection between roots and leaves, and the steady flow of moisture and nourishment from the soil to plant is partially interrupted. Skillful transplanting reduces the interruption to a minimum.

I have tried various methods and the the one I like best is this: First, unless the soil is already quite moist, I water the seedlings which are to be transplanted and allow about fifteen minutes for the water to soak in and distribute itself evenly about the roots. Then I dig a hole at the spot where the seedling is to be planted. I make the hole big enough to accommodate very easily the root of the seedling with its adhering soil, and deep enough so that the plant will sit a little lower than it did originally. Then I fill the hole with water and go and dig up the seedling with as much soil as possible clinging to its roots. By the time I have transferred it to its new location, most of the water has drained away from the hole leaving mud in the bottom.

I let the root of the seedling rest on the mud and, while I hold the plant upright with my left hand, I brush dry soil into the hole with my right hand and press it hard against the root. This causes the mud to ooze upwards and cover the root. When the hole is filled and the soil well firmed, I pour more water over the surface, put an inverted flowerpot over the seedling and offer up a little prayer. I have used this method on seedlings which are generally held to be hard to transplant, such as cauliflower, and have not lost a single one.

Some experts recommend removing some of the leaves, others advise cutting off the top half of the leaves. I do neither. Almost always, the lower leaves wither and either fall off or can be pulled off in two or three days. The plant should be kept covered until it can be exposed to the sun without serious drooping. This may take several days—don't be in a hurry. Use a cover which has some ventilation (if I use a flowerpot I raise the bottom edge on a stone or stick so that there is a through draft) and in hot weather give the plant a drink of water every day.

For the rest, experience will teach you—not only the art and science of growing plants, but also the wisdom of ignoring a good deal or what you read in print. You will come to rely more and more on your own observations and less and less on the opinions of experts and of people like me who write for magazines. That is all to the good, for in gardening there is no teacher like experience and when the day comes on which you find yourself hotly defending your own views against those of your neighbor's you may feel that you have graduated.

But even though you finally reject all that I have written about location, seed-sowing, thinning and transplanting, I know you will agree with me, more and more definitely as the years go by, that eighty-per-cent of success in gardening depends on the soil. Never neglect it, never fail to feed it or to give it all the time and attention you can spare. Live with it and come to love it. Every hour of labor you put into its improvement will save you two hours on your other gardening operations and give you plants that will fill you with pride and satisfaction.

vegetables - - Chem Comp

VEGETABLES V

by DR. WILLIAM R

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GREEN vegetables are the best source of vitamins, providing they are properly grown. Vitamins are, as used by animal physiologists, certain substances that are necessary in small amounts for the proper functioning of the animal organism. For the most part, vitamins have their origin in a plant. Vitamins are formed by fresh-water algae, yeasts, and by higher plants but in varying amounts. It has long been known that the vitamin B content of the kernel of millet and the vitamin A content of the wheat kernel are highest when grown on manured land. The manure apparently contains substances which enable the plant to manufacture vitamins A and B. It has also been found that the content of vitamin A in the leaves of *Coleus* is higher when the plants are grown in fertile soil than when grown in sand. The production of vitamins appears to vary with the variety of plant, its maturity, and the climatic and soil conditions of its habitat.

The vitamin A, thiamine, riboflavin, niacin, and ascorbic acid (vitamin C) content of many of our common vegetables are given in Table 1. It is interesting to note that most plants which are high in vitamin A are also high in vitamin C (ascorbic acid), and that the plants which usually are used as "greens" are high in these vitamins.

A Commercial Spinach Field

Not long ago Mr. J. I. Rodale and the writer were driving to New York City and

Name of Plant	Vit. In micrograms
Asparagus	16
Lima beans, green	25
Beans, snap	08
Beet greens	05
Beets	03
Broccoli	09
Brussels sprouts	11
Cabbage	07
Carrots	07
Cauliflower	10
Celery	03
Chard	06
Collards	22
Corn, sweet	15
Cucumbers	04
Dandelion greens	19
Eggplant	07
Kale	12
Lettuce, headed	06
Lettuce, others	06
Mustard greens	09
Okra	12
Onions, mature	03
Parsnips	11
Peas, green	36
Peppers, green	07
Potatoes	11
Pumpkin	05
Radishes	04
Rutabagas	06
Spinach	12
Squash, summer	04
Squash, winter	05
Sweet potato	10
Tomatoes	06
Turnip greens	10
Turnips	06

* U. S. Department of Agriculture Miscellaneous 572.

S VITAMINS

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Vita mine Milligrams	Riboflavin Milligrams	Niacin Milligrams	Ascorbic Acid Milligrams
16	.17	1.2	33
25	.14	.9	32
08	.10	.6	19
05	.17	.3	34
03	.05	.4	10
09	.21	.9	118
11	.06	.3	94
07	.06	.3	52
07	.06	.5	6
10	.11	.6	69
03	.04	.3	7
06	.13	.2	38
22	.20	.8	100
15	.14	1.4	12
04	.09	.2	8
19	.14	.8	36
07	.06	.8	5
12	.35	.8	115
06	.07	.2	8
06	.07	.2	18
09	.20	.8	102
12	.10	.7	30
03	.02	.1	9
11	.09	.2	18
36	.18	2.1	26
07	.04	.4	120
11	.04	1.2	17
05	.08	.6	8
04	.04	.1	24
06	.06	.5	36
12	.24	.7	59
04	.05	1.1	17
05	.08	.6	8
10	.06	.7	22
06	.04	.6	23
10	.56	.8	136
06	.06	.5	28

Miscellaneou 372.

noticed a vegetable grower drilling spinach seed in a sizeable field. We stopped for an interview with the grower and an inspection of the soil. We learned that for the past several years manure was not available and only artificial chemical fertilizers were used. Sodium nitrate could be seen at the ends of the field where it had not been covered. This spinach was being grown for the New York City markets. Later in the growing season we again visited this spinach field and found the plants to be deep green and apparently healthy. Upon tasting, however, the leaves were found to have a distinctly bitter taste.

Nitrates in Excess

Our experience with this spinach field was brought to our attention rather forcefully by the article, "Nitrate in Foods and Its Relation to Health," by Professor J. K. Wilson in the January 1949 issue of Agronomy Journal. Mr. Rodale has already given the essence of this article in his Editorial in the April issue of the *Organic Gardening* magazine. According to Professor Wilson, "The present practice of applying large applications of nitrate of soda to crops in order to produce succulent material with a bright green color and to obtain heavier yields may be responsible in most cases for the high content of nitrate in these foods."

The vegetables which are grown for "greens" and are highest in vitamins A and C are also the vegetables which are liable to absorb excessive amounts of nitrates from the soils which are fertilized with highly soluble nitrates, as indicated in Mr. Rodale's editorial already referred to. In parts per million the nitrate content of vegetables grown at Ithaca, N. Y. varied from 50 in asparagus to over 5,000 in rhubarb. If, according to Professor Wilson, "it is assumed that 1 gram of potassium nitrate ingested in a single meal is toxic, a basis is available for evaluating the effect of nitrate on human adults. Using the finding recorded in this paper it would be necessary to ingest only 3.9 ounces of rhubarb to get a toxic quantity

(Please turn to page 53)

PLATE 1 Photo by Herbert Clarence White

FROM BLOSSOM TO GIANT IN TWENTY-ONE DAYS!

Herbert C. White proudly exhibits his "baby" squash, 30-inches long and weighing 45-pounds on his Biological Research Farm in Paradise, California. When fully mature, these two vines in a single "hill" produced fourteen monsters averaging 50 pounds each, or 700 pounds of banana squash! The vines covered 3,300 square feet of garden space.

THE TALE OF TWO SQUASH VINES

What Made Them Grow?

By HERBERT CLARENCE WHITE

LAST week I received a letter from a new friend in Chicago. Among other interesting and informative items this gentleman from the big "windy city" wrote the following words of counsel and admonition:

"At the risk of offending you, I am sorry to see that you are in the business of involving earthworms, and I hope that you will discard that phase of your life, and soon!"

A day or two later, having sufficiently recovered from "shock", I replied to this urgent call to abandon friend earthworm, as follows:

"I am much interested in what you have to say relative to the earthworm. No, you haven't offended me at all. I too, am looking for Truth—the whole Truth—and nothing but the Truth. *If* the earthworm scientists have been *wrong* in their claims regarding the benefits to be derived from a large earthworm population in the soil; *I will be the first* to give up and forever abandon this phase of my activities. If, on the other hand, their claims cannot be disproved, and my own personal experiments show them to be *right;* then I shall continue to use the earthworm extensively in my soil-building program. In any case, I shall *study, experiment, and observe.*"

Squashes in Paradise

All this friendly argument anent the lowly earthworm suggests to me that I recount for you the thrilling experience we had here in Paradise last Summer with a single hill of banana squash planted in the corner of our 6' x 12' earthworm bed out in the vegetable garden. And when I have finished this "tale of two squash vines" and how they grew—you yourselves can be the judges. Are the earthworms master soil-builders? or are we laboring under a *delusion* when we recommend him as "God's Gift to Agriculture"?

Ever since I became a "convert" to organiculture six years ago, I have agreed with the wise old Frenchman, who declared: "The Good God knows how to build fertile soil; and He has given the *secret* to the earthworm."

And now comes this faith-shattering letter from Chicago, preemptorily urging me to renounce this phase of my agricultural life—and SOON! But who am *I*, that I should pass judgment on the activities (good or bad) of these little earthworkers, when such world-famous scientists as Charles Darwin, Sir Albert Howard, Dr. Ehrenfried Pfeiffer, and others have eulogized his activities in glowing words of praise.

My good friend, while denouncing the efficacy of the earthworm as a soil builder, is loud in his praise of HUMUS. In his recent letter, he says: "Humus is the go-between for the plant root and the mineral salts of the soil. One without the other, is silly. Humus with the mineral salts omitted is like buying an airplane without an engine. Mineral salts in the soil, without any humus in that same soil, is like flying an airplane without any gasoline!!"

Dr. Pfeiffer on the Earthworm

On the second page of his very informative letter, this gentleman points with no little pride to the fact that he is a personal friend of Dr. Ehrenfried Pfeiffer. Furthermore, he hastens to say, "Dr. Pfeiffer is the outstanding authority today, in America, on soil bacteriology."

It might be refreshing to all of us,

including my good friend from Chicago, to review for a moment just what Dr. Pfeiffer has written on the subject of "HUMUS" and "EARTHWORMS". Here it is, as quoted from an article in the *Bio-Dynamic Magazine.*

"Humus is the basis of the fertility of the soil. But not all substances called humus are 'humus'. There is *only one kind* which provides the most valuable substances and a desirable soil structure. The scientist calls it the *neutral colloidal humus;* neutral with regard to its reaction as compared with an acid or alkaline state. All cultivated plants thrive best in a neutral soil, while with increasing acidity, more and more cultivated plants cease to grow. They dislike alkaline soil just as much. . . . The presence of neutral colloidal humus is necessary in order to maintain the soil life as well as proper plant growth.

"This humus is produced by a fermentation process which takes place in a *living soil.* It is composed of decaying plant matter, leaves, dead roots, stems, straw, and also manure, compost and the bodies of microbes, bacteria and algae living in the soil. *One animal is devoted exclusively to humus production — the EARTHWORM."*

Dr. Oliver and the Earthworm

Dr. George Sheffield Oliver, in his book, "Our Friend, the Earthworm", is in perfect agreement with Dr. Pfeiffer on this important point. He writes:

"Most soils are deficient in elements necessary for plant life, not because the elements are not present, but because they are unavailable to the plant roots. All the elements that are in the soil, but which are hidden and unavailable to the plant roots, are broken down by the earthworm and made available. Man has yet to invent, devise or manufacture any machine, any solid or liquid fertilizer as efficient as the earthworm. In this invertebrate animal Nature has provided a perpetual soil builder, a four-in-one creature that acts upon the soil as a chemist, triturator, cultivator and distributor of plant food."

Sir Albert Howard's View

Our array of scientific testimony in favor of the earthworm would not be complete without a word from the founder of the Organic Gardening Movement throughout the world—the late Sir Albert Howard, of London. In his book, "The War in the Soil", he writes: "The lowly earthworm is the great conditioner of the food materials for healthy crops." And Charles Darwin sums up the whole moot question in one "atom-smashing" sentence: "Without the earthworm—*NO tillable soil!*"

Earthworms and Squash Vines

But let's get back to those two banana squash vines, and what the earthworms did to make them grow. For after all is said and done, I don't *know anything* until I see it in my own garden. For me the acid test is what I find in my own back yard in beautiful Paradise Heights.

The two squash vines (gourdy heroes of our story) were planted in the corner of an earthworm bed adjacent to our strawberry patch and vegetable garden in the latter part of May. On the seventh of June, when I started north with a trailer-load of 100,000 of Dr. Oliver's famous pedigree "Soilution" earthworms, destined for a Yakima cooperative, these two squash vines were just making a healthy start in life. And what a squash-filled life theirs proved to be!

On the ninth of July, I returned to Paradise, after a full month of "Soil and Health" lectures in the "Evergreen State". To my surprise, those two little squash vines had grown to almost heroic proportions. They had completely filled the 6' x 12' bed with rich, deep foliage, and were trailing out in every direction from the low walls of the earthworm culture bed.

By this time, most of the soil, peat moss, and manure (our favorite media for the culture of the domesticated "Soilution" earthworms) had been

converted into "castings" or earthworm manure, as Editor J. I. Rodale calls it.

At this time (ninth of July), I noticed the first tiny banana-shaped squash putting in an appearance. The phenominal growth of that tiny squash under the healthy stimulation of these rich "castings" was recorded at intervals with photographs by the author.

Then on July 27th, I was called back to Washington for more lectures. During those eighteen days the tiny, baby squash had grown to almost unbelievable proportions. I shouldn't have done it, but the temptation was too strong, and I picked my baby squash—and what a baby! After eighteen days of growth, it measured 30 inches in length and weighed exactly 45 pounds! (See Plate I)

Grew an Inch a Day

On the day that I picked our "baby" squash it was growing at the rate of one inch a day, and was putting on weight at the magic rate of two and one-half pounds every twenty-four hours. We are still wondering what would have happened if we had let it reach full maturity—in other words, if we had given it another three weeks of growth. Your guess is as good as mine, and we shall never know.

I really should have left it on the vine; but I was so proud and excited over my prodigy, I just *had* to cart it off to Washington as another trophy for this miraculous thing we call "biological soil building." During the eighteen days that I was home in Paradise during July they had stretched themselves out over a large part of the garden. In fact they covered an area of 1,250 square feet—equal to a good-sized two-bedroom house.

On September seventh I returned the second time from Washington. You can well imagine my surprise and delight when I counted thirteen big fellows hanging on these two vines (this in addition to the 45-pound "baby" I had picked in July). Some of these were heroic in their proportions—all were BIG. One huge fellow nearly four feet in length and weighing 55 pounds was taken to the Paradise Chamber of Commerce for display. Another measuring 53 inches from stem to "stern" (on the convex side) and weighing 65 pounds was carted off to Southern California to help stir up interest in Organiculture. Everywhere we went, the response was spontaneous and enthusiastic! Even little grandson Jimmy Matheson, enjoyed playing with the big fellow. In Gardena, my old "stamping ground", newspaper editors and photographers came out to get pictures and a "story" of this giant squash from Paradise.

Everyone agreed that fourteen large squash, averaging 50 pounds apiece, and growing on a single "hill" was a good record in anybody's garden. Seven hundred pounds of squash from only two vines! But what vines they were! By harvest-time those two vines had spread fifty-five feet in one direction and sixty feet in the other. Motto:—If you're planning to grow squash with the help of earthworms—GIVE 'EM ROOM! In fact, before we pulled up those miraculous vines, they covered an area of 3,300 square feet, an area equivalent to three modern two-bedroom houses.

A Comparison

In another portion of the garden last May, we planted some Hubbard squash and some old-fashioned pumpkins. In the holes prepared for these, we placed some well-rotted cow manure, some leaf-mould, and some river-bottom silt—but NO compost and NO earthworm castings.

As the growing season progressed I was much disappointed in the lack of growth in these vines. In fact we couldn't have done a more perfect job of producing "dwarf" vines and "dwarf" pumpkins if we had tried! When fully mature these vines spread out from five to ten feet in each direction, and bore on an average of one to two pumpkins to the vine. These were about the size of cantaloupes. We harvested about fifteen pounds of produce to the hill.

At this point, may I ask our friend

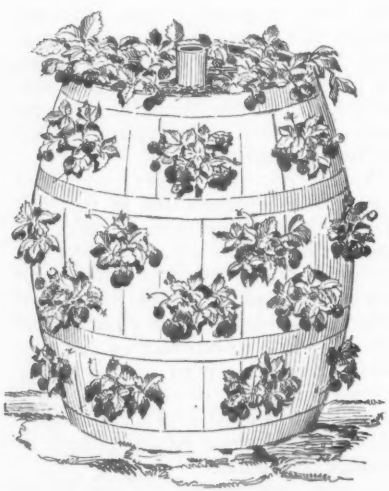
from Chicago: If the earthworm is of negligible importance to soil fertility and soil building, why didn't our pumpkins or our Hubbard squash grow up? When one hill *with earthworms* produces 700 pounds of squash, and another hill *without* the benefit of earthworms in the same garden produces a few "nubbins" weighing three or four pounds apiece, the mooted question is no longer "moot"! In fact, the direction we should take seems crystal clear to a simple-minded, unscientific person like me. Instead of precipitous abandonment of my faith in the efficacy of the earthworm as a soil builder, that faith has been strengthened immeasurably. Instead of looking around for other sources of power in the soil, I am more convinced than ever that biological soil building pays. My private and very personal advice to my friend (and to all others) who may bear a "grudge" against the earthworm is this. Put these little "earthworkers" to the test in your own backyard gardens before you cast another stone at Nature's gift to a fertile and healthy soil.

In closing, may I quote Bernice Fitz-Gibbon, who once said: "T'aint knowing nothing that does as much harm, as knowing so much that ain't so." And that, my friends, seems to be the trouble with the proponents of modern, orthodox agriculture.

Strawberries

STRAWBERRY BARREL

A strawberry barrel is at the same time ornamental and practical. Select a stout barrel, preferably one with heavy oak staves and metal hoops. Bore holes in the side of the barrel where the strawberry plants are to be set. A 2-inch hole will permit easy planting and ample room for growth of the plant. The holes should be spaced so that eventually the entire surface of the barrel will be covered. Cut a metal or terra cotta pipe about three inches in diameter and about six inches longer than the barrel. This pipe should have perforations throughout its length to permit watering and aeration of the soil. Set the barrel in position, put the pipe in place, and fill the barrel with the planting mixture composed of well-fermented compost, good topsoil, and enough sand to make the mixture light and friable. The plants may then be set in the holes in the side of the barrel and over the top, as shown in the accompanying illustration.



BOTANY FOR THE GARDENER (18)

By DR. WILLIAM H. EYSTER

AMPHIBIOUS PLANTS

Liverworts

THE liverworts are primitive plants which live in water or in the presence of abundant moisture on soil, on rocks, and on tree trunks. They may be regarded as amphibious plants which are bound to the water and at the same time emerging from the water to become land plants. In this respect they are like the salamander, frogs, and toads of the animal kingdom which breed in ponds and streams but, as adults, tend to establish themselves on the land where they find food and shelter. There are about 6,000 species of liverworts, but they are little known by the ordinary gardener. They may be regarded as a transitional group of plants between the algae which are mostly aquatic and the higher plants which anchor themselves in the soil with roots. Liverworts are green plants which are repeatedly forked and may be radial or leaf-like in structure. Some species grow on the surface of quiet pools with delicate white rhizoids hanging down in the water, while others grow on moist surfaces to which they are attached by the many hair-like rhizoids on the under surface.

If you are unfamiliar with liverworts, look for them in moist places. They are flat and have a dull green color. Do not confuse them with mosses which bear spirally arranged leaves. You should be able to recognize them from the following descriptions and illustrations.

Kinds of Liverworts

The liverworts are divided into three rather easily distinguishable orders. These are the flat leaf-like or thallose liverworts, the *Marchantiales;* the leafy liverworts which appear to have a stem and lateral leaves, the *Jungermanniales;* and the horned liverworts, the *Anthocerotales.*

The Thallose Liverworts

The thallose liverworts are the simplest and some species live in water or floating on the surface. A common floating form is *Riccia fluitans,* and is illustrated in Fig. 47A. A related form, *Riccia natans,* which grows on moist soil is shown in Fig. 47B. The floating form of Riccia natans is shown in Fig. 47C. There are more than a hundred species of thallose liverworts which either float on the water or anchor themselves on moist surfaces.

Larger and more complex thallose liverworts which grow on moist soil, faces of cliffs which are kept moist by dripping soil water, and along moist banks of streams are *Conocephalus* and *Marchantia.* Marchantia often grows on the soil in moist flower beds, along the north side of houses, and many other places which remain sufficiently moist throughout the sum-

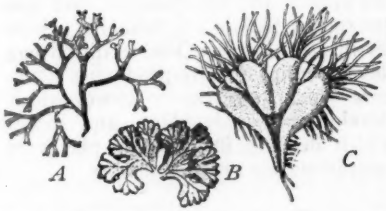


Fig. 47 Simple thallus liverworts. (A) *Riccia fluitans,* (B) *Riccia natans* as it appears when floating on the surface of water. (C) *Riccia natans* as it appears when it grows on moist soil.

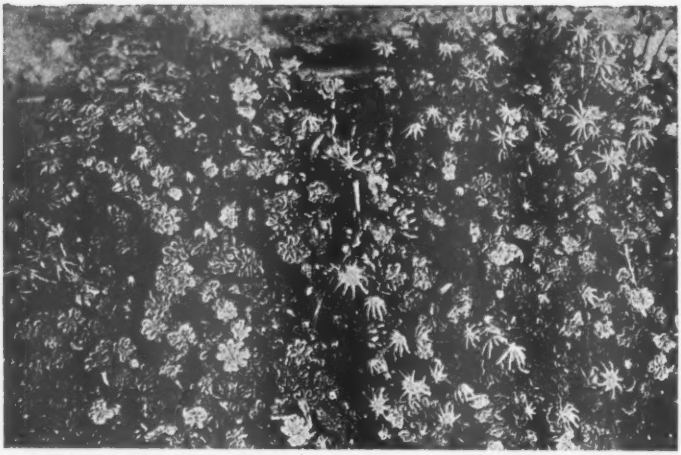


Fig. 48. A colony of *Marchantia polymorpha,* including both female and male plants.

mer. A compact growth of Marchantia plants is illustrated in Fig. 48. These plants have sexual branches. The umbrella-like sexual branches which have a scalloped margin are male branches of male plants, while those with finger-like projections around the central disk are female sex branches. Drawings of sections of thallus and the sexual branches are shown in Fig. 49. *A* is the tip of a female thallus with an upright sexual branch which bears the female sex organs including the eggs, while *B* is the end of the male thallus bearing a male sex branch which produces the male sex organs and sperm. The sperm eventually emerge on the upper surface of the pavillion-like male sex branch and are splashed with water to the female sex branches where fertilization occurs. The fertilized egg develops into a spore-producing structure which gives rise to spores which develop into male plants and spores which develop into female plants in approximately equal numbers.

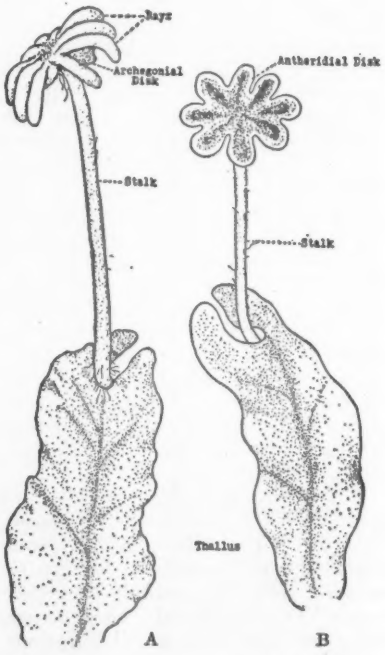


Fig. 49. The tips of plants with sexual branches. (A) a female plant with a female sexual branch which produces eggs. (B) A male sexual branch which produces the sperm. Sperm are transferred from the male to the female branches by splashing water.

The Leafy Liverworts

This is by far the largest group of liverworts. They occur in all parts of the world but are especially prevalent

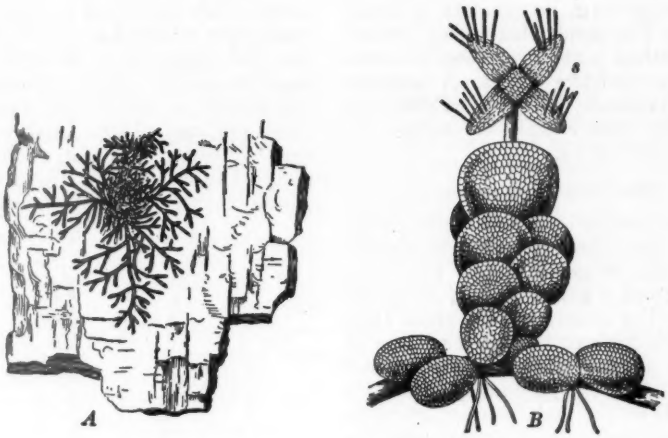


Fig. 50. (A) A common leafy liverwort, Frullania, as it appears when growing on the moist bark of a tree. (B) A small part of the plant shown in (A) showing the stem, rhizoids, overlapping leaves, and a fruiting structure.

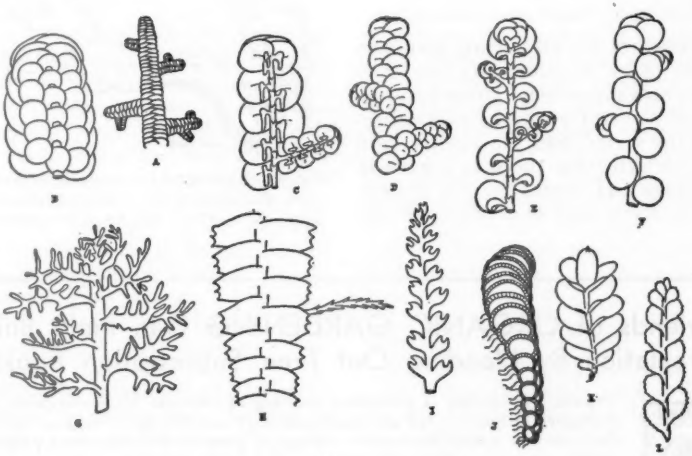


Fig. 51. Drawings of a number of common leafy liverworts to show the general appearance of these little-known but interesting plants.

in the tropics, where large numbers of related forms also occur. They grow on logs, tree trunks, branches, moist rocks and often form dense mats in shady places. The slender branching "stems" are clothed with three rows of membranous scalelike leaves. A common leafy liverwort, Frullania, is shown in Fig. 50. Other leafy liverworts are shown in Fig. 51.

The Horned Liverworts

The horned are the highest developed and most complex liverworts. They live in moist places. The plant consists of a small, simple, irregularly lobed or branched dark green thallus with little or no differentiation of tissues and air chambers. It is firmly anchored to the ground by numerous rhizoids on the under surface. Pores in the lower surface of the plant often are inhabited by a blue-green alga, *Nostoc*. The most favored habitat of Anthoceros is a firm wet creek bank or the wet ground among the stems of grasses and sedges in marshes. A portion of Anthoceros, a horned liverwort is shown in Fig. 52.

Economic Value of Liverworts

Liverworts are interesting members of the plant kingdom because they represent a transitional group between aquatic plants, i. e. those living entirely in the water, and the strictly land plants which form roots as organs of anchorage and organs for the absorption of water and minerals from the soil. Liverworts grow on surfaces which might otherwise be naked and thus play a small part in clothing the earth. They represent an exceedingly small part of the Earth's Green Carpet. On rocks, their decayed bodies form the humus which makes possible the growth of mosses and eventually ferns and seed plants. In this respect the liverworts may be regarded as pioneers in establishing the growth of plants on originally bare rocks.

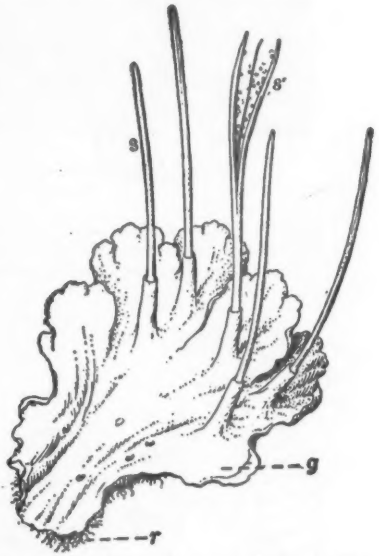


Fig. 52. A portion of a common horned liverwort, Anthoceros, bearing sporophytes shedding spores which will grow into new plants.

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TAWNY

By EVELYN SPEIDEN

SINCE he could not talk, I shall probably never know how he happened to appear at my doorway one June morning—a beautiful brown and white carrier pigeon. Yet there he was walking around, keeping out of reach but not very timid. I was going away but threw on the ground for him a handful of mixed grains and cereals that happened to be on hand. Several hours later on my return, he was still there, had eaten up everything and was ready for more. I wondered if he was injured, but after awhile he took off with a few chirps and circled the house in great free swings of his powerful, white wings.

Tawny Prefers Organically Grown Wheat

He seemed to be able to eat constantly, at first indiscriminately. Then he began to pick out the cracked wheat and leave the oats, corn and soy meal. It happened that this wheat was the only organically grown item of the menu offered him, some I had bought because my own Bio-Dynamically grown wheat had given out. He spent most of the day here and there on the ground outside, searching for more bits, and in the evening as a storm was approaching he flew up, made a great circle of the valley and then disappeared westward. "Now he is continuing his journey," I thought, "and that is the end of his visit."

Long Flights for Food

Before the next morning was far advanced, however, there he was at the door again. And this time he walked right in, since my new house was still screenless. At first he stayed near the door and if I approached too near him, or made any sudden motions, he walked sedately out. I threw some grains on the floor for him. This was a mistake, for he thereupon included the house as a whole in his explorations and search for the grain he wanted,—and he investigated every nook and corner. The weather was too hot to shut doors and windows, and I could not keep him out. He was polite and clean, but very curious, and did everything but talk to show me what he wanted. When he had had enough, he would sit on top of the wall, fluff up his breast feathers, sink his head into them and seem to doze off. Or he would fly around and up to the ridge pole of the house, sitting there like a little weathervane, only more quietly. From the big windows on the second floor that overlook the valley I could watch his occasional flights, most beautiful to see. He seemed to be a white bird when in the air, and much larger than his appearance on the ground would lead one to expect. It was easy to follow the steady rhythm of those powerful wings in the sun, as he flew in greater or lesser circles, low over and around the dark trees or high enough to nearly disappear in the clouds. Then suddenly he would curve towards the house and alight just over my head. One could almost have the thrill of actual flight in watching him, so fast and yet with so little effort, a much slower wing beat than the smaller birds, reminiscent of the sea-going fliers.

Begged for the last Kernels

He learned to go up and down stairs —walking, not flying; and if I shut one door to keep him out, he was soon back via the other door. Day after day he returned, until my supply of organically grown wheat dwindled. Steadily he refused anything else, although the other grains lay at hand, and gradually as I gave him less and less, he was certainly hungry. One day while away, I shut both doors,

leaving him out. On my return he came downstairs to meet me. Some window was evidently open wide enough for him to squeeze through, and later I found which one. Shut out of the house, he would fly up and pace the windowsills. As he became more hungry I sat on the back doorstep, sprinkled a little grain nearby on the ground and held more in my hand. He approached daintily, pecking up each speck as he came, hesitated now and then at coming closer, but finally began to eat out of my hand. This he did often afterwards.

Failed to Return When Supply was Exhausted

Finally becoming disgusted at my niggardly supply of organic grain, one evening he took off for the west with a scolding chatter. So far he has not returned. His roosting place was probably at some distance for he started westward each evening a couple of hours before dusk and appeared about the same hour after dawn in the morning. Eventually he must have decided that so long a flight was too far for such a small amount of the grain he liked so well.

SEWAGE SLUDGE and HUMAN EXCREMENT

There are various processes of treating city sewage wastes and the final products vary in their composition and texture accordingly. The problem is, however, more complicated than the physical makeup of the material, since city sewers may carry all kinds of harmful substances. Chemical wastes are often emptied into sewers and part of the sodium, chlorine, sulfur, tar products may be contained in the sludge after processing. A complete chemical analysis is usually not required and the purchaser may therefore get materials that he would not knowingly incorporate in his garden soil. Different regions produce different sludge products and the buyer had best be cautious. As a rule, sludge is classified as a source of nitrogen and will, indeed, act as a bacteria stimulator in the compost heap, though the nitrogen content may not be above one per cent. Low-grade sludge, made by the Imhoff process, is made by anaerobic bacteria in the way septic tanks operate. It analyses about 1 per cent phosphoric acid and 1.0-3.3 nitrogen. Sludge that is run out on filter beds analyses .3 phosphoric acid and .7 nitrogen, while activated sludge, made under air currents through air-borne bacteria has an approximate analysis of 4.0-6.2 nitrogen, 2.5-4.0 per cent phosphoric acid, and plenty of organic matter. The well-known products *Milorganite* (Milwaukee) and *Nitorganic* (Pasadena) are activated sludges, made by a special process, and contain the analysis on the bag. While some have feared that disease germs may still be contained in activated sludge there is no reliable information available that disease was carried through the stage of bacterial digestion. If used in the composting process, such disease organisms would hardly survive. When in doubt, apply the material to lawn, ornamentals, trees, etc. and save the standard compost for the vegetable garden.

An analysis of the Hartford, Conn. works shows that sludge cake has a varied analysis as follows:

Sludge Cake from Belt, Hartford
Based on % Dry Solids

Ash	47 to 70%
Volatile	30 to 53%
Humus	30 to 52.6%
CaO as Ca^2Co^3	0.33 to 1.19%
Potash, K^2O, as K^2CO^3	0.2 to 0.5%
Phosphoric Acid as P^2O5	1.2 to 2.4%
Nitrogen (Total)	1.7 to 2.26%
Ammonia Nitrogen	2.01 to 2.75%
Chlorides	0.14 to 0.12%
Acid Soluble Iron	4/10 of 1%
Ether Soluble Grease	6.2 to 16.9%

Analysis of Milorganite

Basic Fertilizer Elements	%	*Lbs. per Ton*
Nitrogen (all organic)	6.04	120.8
Phosphoric acid (total)	3.18	63.6
Potash	.80	16.0
Sulphur	2.69	53.8
Magnesium	1.68	33.6
Calcium	1.55	31.0
Iron	6.63	132.6
Chlorine	0.47	9.4

Minor or Trace Elements

	Parts per million	*Pounds per ton*
Copper oxide	430	0.86
Manganese oxide	327	0.75
Zinc oxide	163	0.33
Chromium oxide	2,190	4.40
Lead oxide	2,250	4.50
Titanium oxide	830	1.66
Boron oxide	40	0.08
Nickel oxide	52	0.10
Arsenious oxide	134	0.27

CONSTITUENTS OF SLUDGE [1]

The average fertilizer constituents of a number of sludges collected, together with some other constituents are shown below:

Average composition of sludges (in per cent on dry basis)

	Digested	*Activated*
Total nitrogen	2.25	5.0
Total phosphoric acid[2]	1.50	2.50
Available phosphoric acid[2].	1.00	2.00
Potash [3]	0.50	0.50
Organic matter	60-40	75-65
Ash	40-60	25-35
Iron and aluminum oxide	7.60	7.50
Magnesia	0.50	0.50
Lime	6.00	1.35
Insoluble ash	41.50	27.50
Pentosans	1.50	2.10
Grease	9.80	13.30
Crude fiber	7.35	7.50

[1]New Jersey Extension Bulletin 125.
[2]Phosphorus pentoxide. [3]Potassium oxide.

BREAK UP THE SEWAGE SLUDGE

In putting sludge into a compost heap, it must be thoroughly broken up, otherwise it will not be able to aerate itself, and it should be applied in very thin layers, not more than one inch at any one place. Also use ACTIVO bacterial product and the domesticated variety of earthworms.

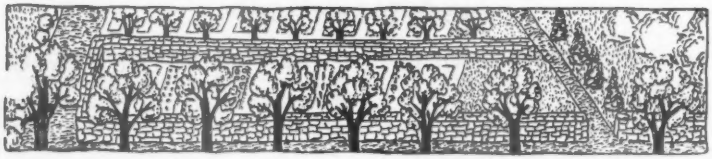
Even where sludge has been laying on dumps for many years we do not advise its use until thoroughly composted, otherwise it will be a shock to the land. Also it is an unbalanced material and should be composted with a variety of green matter.

Human Excrement

Human excrement should be used in making compost only as a last resort. If a little energy and imagination are used other safer organic residues will be found. The danger of using human excrement is that it may carry disease germs. Therefore it must be most thoroughly composted and we would suggest that some bacterial preparation such as ACTIVO be used, as well as the domesticated variety of earthworms. Also the heap should be turned several times so that every part of it has a chance to get into the middle where the heat can kill off disease organisms.

In using human manure, use plenty of green matter along with it as it is quite concentrated. Where six inches of green matter to two inches of animal manure is used in the Sir Albert Howard process, use ten inches of green matter to less than one inch of human excrement. The top of the heap should have at least two inches of top-soil.

In country toilets where chemicals are used, the resulting product could not be used as a fertilizer.



Garden Calendar—May

THE NORTH AND EAST

The green of the leaves which have been so recently unfolded may be regarded as green lights to go full speed ahead with all garden activities. It is time to sow the seeds of the most tender annuals, and set out the seedlings of the half-hardy and hardy annuals which were started indoors. Pinch out the tops of the seedlings before setting them in their permanent places in the garden.

Flower Garden. Take time to prepare well the soil for the flower gardens. Work into the soil liberal amounts of compost (not fresh manure). For continuous bloom, make repeated plantings of your favorite flowers. Some plants do not like to be pruned, as asters, poppies, nicotianas, begonias, and fuchsias. In transplanting seedlings to the garden it is advisable to select a cool cloudy day rather than a warm, sunny one.

May is a good time to plant such lilies as regal, Japanese gold banded, and the showy lily. It is time also to transplant to the garden the rooted slips from dahlia roots. It is well to set the stakes at the time the slips are planted.

As soon as the tulips are out of bloom, break off the seed pods and allow the foliage to remain on the plant so that the plant may recover its normal vigor and store up food in the bulb for next year's growth. In that case take up the bulbs before they have completed their growth.

Chrysanthemum cuttings made by May 15 will finish in six-inch pots and make satisfactory house plants for fall. Some spring-blooming perennials can be induced to bloom a second time by cutting off the stems which have just finished blooming. Give the peonies a good dressing of compost as they are now forming the flowers which will open in late May or early June.

The amaryllis that flowered in early spring, like other spring flowering bulbiferous plants, must be allowed to develop the bulb for next year's flowers. Feed them twice a week with compost water, then as the leaves show signs of yellowing, dry them off gradually by turning the pots on their sides in a dry shaded place.

Begonias are excellent plants for bedding, particularly if all the plants are propagated asexually from a common parent plant. This will insure uniformity. Do not overlook the tuberous rooted begonias for bedding. Fill a flat with a mixture of compost and sand and half bury the bulbs in this material. Water them once and shade them from the sun. Under favorable conditions they will show signs of growth and be ready to plant out in two or three weeks.

Rose Garden. Roses may be freed of their winter protection. Examine your plants and be sure to remove any shoots that may be growing from the stock below the point at which it was budded. If large flowers are desired, all but the terminal buds should be removed as soon as they appear. Hybrid teas and hybrid perpetuals respond to budding; polyanthus and landscape roses need not be disbudded. Rose flowers should be cut early in the morning before any of the petals have unfolded.

Shrubs and Trees. Prune maples as the buds are bursting and they will not bleed. All spring-blooming shrubs, as forsythia, lilac, and spiraea, should be

pruned immediately after they have finished flowering. Prune evergreens by pinching out the growing tips of the stems. In pruning hedges, be sure that the base of the hedge is somewhat wider than the top.

Vegetable Garden. Practically all vegetables which are regarded as *tender* may be set out in the garden this month. In doing this it may be well to take into consideration the last average date of killing frost for your particular region.

THE WEST COAST

Flower Garden. Succession sowings may be made of the seeds of California poppy, godetia, clarkia, Shirley poppy, and calendula to provide color in the garden during all the summer and far into the fall. Plan now to avoid a colorless and dead-looking summer garden. This can be avoided by planting summer bulbs and annuals as pompon dahlias, gladiolus, tuberous-rooted begonias, tigridia, summer-flowering hyacinths, and your choice of annuals. Be sure to include tithonia. Plant chrysanthemums out in beds that are now occupied by annuals which are about through blooming. By pinching out the upper three or four inches of chrysanthemum plants and rooting them in sand, you can greatly increase the number of your plants.

Shrubs and Trees. Evergreen shrubs and such tropical plants as paperplant, bamboo, elephant-ear, and bird-of-paradise may be planted in May. Such broad-leaved evergreens as abelia, mahonia, acuba, English laurel, and photinia should be cut back to insure strong bushy plants. Lilacs prefer a somewhat alkaline soil and it may be necessary to give them lime from time to time. Such flowering shrubs as rhododendron, azaleas, deutzias, lilacs, mock orange, weigelia, hawthorn, viburnum, flowering crab, flowering cherry, and wisteria add gayety to the garden. These shrubs should be given heavy dressings of compost just before blooming, or as the buds are beginning to form. Remove old flowers as soon as they have faded.

THE SOUTH

Flower Garden. The flower garden is in full splendor and ready for the fullest enjoyment. Prepare the soil for hot weather by covering it with a plant mulch. As soon as the spring garden is finished, prepare the soil and plant the summer garden. Be sure to put all garden wastes in the compost heap. Now that your rich purple carpet of violets has changed to green, it is time to reset the plants for next year's spring garden of violets. Dahlias for fall bloom should be planted now. Sow hibiscus for colorful summer blooms.

Shrubs and Trees. Prune all spring-flowering shrubs. Transplant lantanas. Oleanders may be propagated by rooting cuttings in sand. The cuttings should be made from mature wood. In pruning oleanders, cut out the oldest and also the weakest stems, leaving the most vigorous stems to make more beautiful plants. May is also the time for moving palms.

THE SOUTH WEST

Flower Garden. Plant amaranthus, Australian pea vine, blue lace flower, calliopsis, annual and perennial climbers, cockscomb, cosmos, gaillardia, gypsophila, Hyacinth bean, marigolds, Mexican firebush, moonflower, morning glory, nasturtium, nicotiana portulaca, Shasta daisy, sunflower, verbena, vinca, and zinnia.

Vegetable Garden. Vegetables that may be planted in May include beets, kale, melons, peanuts, pumpkin, sweet potato, and squash.

THE LOWER SOUTH *

Flower Garden. With the warmer weather that comes in May in this part of Florida, fewer flowers are suitable for starting; the following list, however,

* From Edwin H. Abrams, St. Cloud, Florida.

will afford a good variety, together with those already established; some of these blooming during the warm season as well as earlier: Scarlet runner bean, cosmos, gaillardia, globe amaranth, ornamental gourd, ornamental sunflower, marigold, morning glory, petunia, portulaca, salvia, tithonia, verbena, periwinkle, zinnia.

Vegetable Garden. May is also one of the months when only a few of the many vegetables raised here should be planted. Those recommended are: collard, pole beans, mustard, okra, pumpkin, New Zealand spinach. If another planting of corn is wanted, try the black Mexican, or black June corn as it is sometimes called. This is one of the best flavored and tenderest of all varieties. It is good in the early stages, while the kernels are white, or beginning to turn pink. It is equally good a little later when blue, and even at the last, when the kernels are black, if not left too long, so that the kernels are too dry. This garden can be made interesting and attractive by combining flowers and small shrubs, where there is a little space not taken up by vegetable rows.

Shrubs and Trees. The black walnut, which thrives in the north, seems pretty well at home in central Florida. It is one of the northern plants that insists on taking a winter rest and refuses to put out a leaf until May. It is a good tree to plant. In addition to the delicious nuts it bears, the wood is valuable for a number of purposes. For an ornamental, try a rose apple. The foliage is attractive and it is a good shade tree. The fruit is rather peculiar; a smooth, creamy skin, and inside a white pulp somewhat of the consistency of an apple, but not juicy. The flavor is slightly like an apple, and exactly like a rose leaf. The blossom is quite ornamental.

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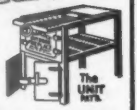

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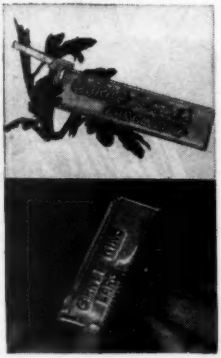

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Vegetables and Vitamins

(from page 33)

of nitrate. If one uses the findings of other workers and makes similar calculations, about 2.3 ounces of spinach, turnips, or certain other vegetables would supply the toxic quantity."

Importance of Compost in Growing "Greens"

The principal purpose of this article is to call attention to the plants which are rich in vitamins, and to emphasize the importance of growing these vegetables in composted soil rather than in soils which have received applications of artificial chemical fertilizers. It is high time that we realize that an excess of any element in the soil and in the metabolism of animals may be as bad or even worse than a deficiency of the element. It is especially important to grow the vegetables which usually are eaten as "greens" in composted soils as they are the ones which are rich in vitamins and may absorb large and even lethal amounts of nitrates and other chemicals.

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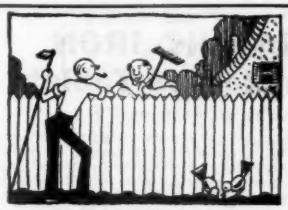

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Q. Are cotton burrs and gin wastes suitable for composting and mulching?
L. R. N., Corsicana, Texas.

A. Cotton burrs and cotton gin wastes are rich in plant nutrients and excellent for composting and for mulching all kinds of plants. Each ton of cotton wastes, for instance, has 26.4 pounds of nitrogen, 9 pounds of phosphorus, and 7.2 pounds of potash in addition to trace elements and the valuable organic matter.

—o—

FORCING GERANIUMS INTO BLOOM

Q. I have some geraniums and other house plants which do not bloom. Can you give me any suggestions as to how to force them?
Mrs. A. C. F., Coudersport, Pa.

A. Avoid nitrogenous fertilizers and keep the plants on the dry side to induce flowering. So far as possible, avoid wetting the foliage when watering the plants.

—o—

CHICKEN MANURE COMPOST

Q. I have about 500 chickens with plenty of 100% poultry manure together with a great deal of litter. I have hesitated to use the manure in a compost heap because it has so much acid. What can I use to neutralize the acid and yet have good compost for my garden?
D. H. B., R. D. No. 2, Farmersburg, Ind.

A. Chicken manure is excellent for the compost heap as it has about twice the strength of other manures. For each 6-inch layer of plant mate-

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rial, use a 1-inch layer of chicken manure. To neutralize the acids, use finely ground phosphate rock and pulverized limestone in alternate layers. Also in each layer use a thin (⅛ inch) layer of soil. The pulverized rocks and soil will neutralize the acids and absorb volatile decomposition products.

—o—

SPRAYING FRUIT TREES

Q. The fruit trees on the farm I am buying have always been sprayed. I am wondering if I can get away from this procedure this coming season,—and how?

F. I., Cuyahoga Falls, Ohio.

A. One of the principles of organic gardening is that insect pests and diseases are Nature's censors that all is not well with our cultural practices. Fruit trees in an orchard are grown under somewhat artificial conditions, and in an environment in which the biological life has been thrown out of balance by poisonous sprays which kill many more beneficial animals than injurious ones. For five years on the organic farm an apple tree which has been composted and rock mulched was, to our best knowledge, free from all scale insects. Last summer an oat field just across the road from this apple tree was sprayed with a weed killer, 2-4-D. This spring this apple tree has a small scale insect on all new growth. Evidently the ladybugs and other insects which ordinarily feed on the scale insects were killed by the poisonous spray.

Scale insects can be cleaned up by spraying the trees, while still in the dormant condition and before any buds have opened, with a 3% oil spray which contains no poisons of any kind. This oil spray kills insects by forming a film over the insects and thus cuts off their supply of oxygen. The insects which usually affect the fruits can be fairly well controlled by having enough of the right kinds of birds in the orchard. This involves every kind

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—o—

SUN SCALD

Q. I used compost for all my vegetables and cantaloupes. I never ate more delicious vegetables and cantaloupes. I was really proud of my tomatoes and peppers when we got an extremely hot wave and they turned white as if scalded on the side of the afternoon sun. That caused them to rot. Was this sun scald or was it blight?

Mrs. P. J. M., Route 2,
Walnutport, Pa.

A. Your plants grew so rapidly that they did not harden sufficiently to withstand the hot sun later in the season. These sun scalds could have been prevented by providing some shade for the plants.

—o—

VERMICULITE

Q. I am puzzled at vermiculite, a hydrous silicate as I understand it. Is it beneficial to the soil?

Mrs. L. A. Z., Walsenburg, Colo.

A. Vermiculite may be any of a number of hydrous silicates derived generally by the alteration of some kind of mica. Vermiculite contains no plant nutrients, but does improve the physical condition of the soil. It greatly increases the soil's water absorbing and water holding capacity.

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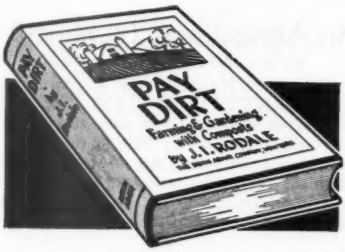

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by J. I. RODALE
Editor of Organic Gardening

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AT the request of thousands of farmers from all parts of the United States and Canada, the ORGANIC GARDENING ORGANIZATION has finally decided to establish a new *farm magazine,* to be called THE ORGANIC FARMER. This magazine will be devoted exclusively to all aspects of farming such as crop rotations, the reclamation of abandoned farms, soil management, soil building and fertilizer practices and other fundamental agricultural practices based on the *organic method.* THE ORGANIC FARMER will in no way duplicate the materials published in the ORGANIC GARDENING magazine. It will be concerned with the organic method as related to farms however small or large. Sufficient tests of the organic method on a farm scale have been made to prove that this method is not only practical but highly profitable. Cover crops as green matter and sheet composting enable the farmer to make compost on a farm scale without special equipment or additional labor. Each issue of THE ORGANIC FARMER will be filled with articles on the organic method on the farm, as well as the latest information on all aspects of farming. It will be issued monthly and contain 64 pages.

The first issue of THE ORGANIC FARMER will appear sometime in June or July of this year. The subscription rates will be $3.00 for one year, $5.00 for two years, and $6.00 for three years.

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by Dr. Ehrenfried Pfeiffer

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